

Plain Facts on Fallout Shelters

# POPULAR SCIENCE

DECEMBER • 35¢ *Monthly*

## This Car Goes Anywhere

with  
Two Engines,  
Six Wheels,  
Boat Body



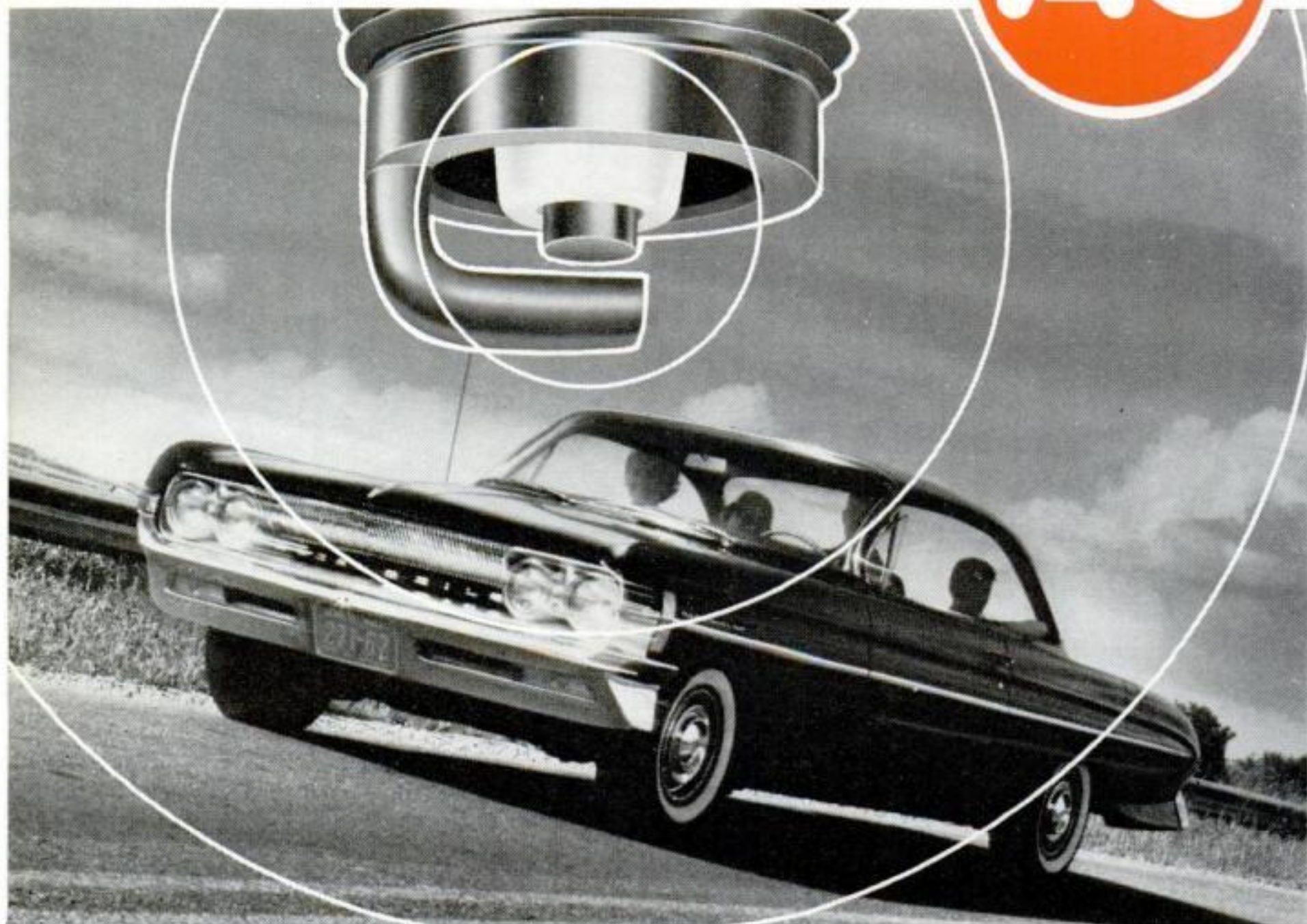
**Special Save-It  
Section:**

**All About Making Tables**

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*self-cleaning*  
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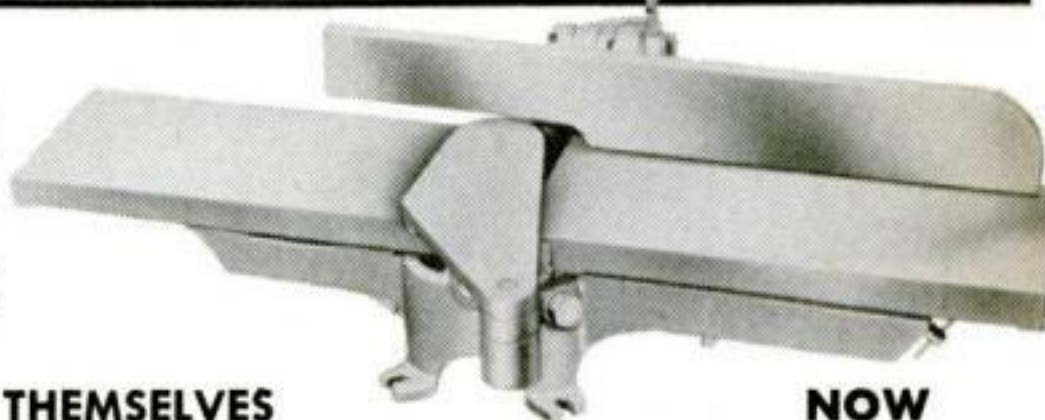
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# SKIPPED ME AGAIN!

POOR BURT! HE MISSED OUT ON THAT PROMOTION AGAIN!



I WAS DETERMINED TO MAKE GOOD IN MY JOB...BUT DETERMINATION, I FOUND, WAS NOT ENOUGH!

I HAD PLENTY OF EXPERIENCE. AND THE BOSS SEEMED TO LIKE ME. I LACKED JUST ONE THING—TRAINING!



SORRY, BURT! I KNOW YOU'VE WORKED HERE LONGER. BUT TED HAS THE SPECIAL TRAINING WE NEED. YOUR CHANCE WILL COME ...SOMEDAY!

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BURT, I'VE JUST MADE YOU THE ASSISTANT MANAGER OF YOUR DIVISION...AT \$15 MORE A WEEK. AND THE WAY YOU'RE GOING NOW, THIS IS JUST THE BEGINNING.



GOSH! THANKS MR. TAYLOR!

I GOT IT, HONEY! I GOT THE PROMOTION! OUR MONEY WORRIES ARE OVER! TODAY'S OUR LUCKY DAY!

TODAY AND THE DAY YOU MAILED THAT I.C.S. COUPON!



WHY NOT MAKE THIS YOUR LUCKY DAY? LET I.C.S. PUT YOU ON THE ROAD TO MORE PAY, RAPID ADVANCEMENT, REAL JOB SECURITY. HERE'S THE FAMOUS COUPON. MAIL IT NOW!



I WAS TIRED OF WAITING FOR "SOMEDAY."  
I MADE UP MY MIND TO ACT! I'D GET THE  
TRAINING I NEEDED...SOMEHOW!  
JANE HAD A SUGGESTION...

I CAN'T QUIT MY  
JOB AND GO BACK TO  
SCHOOL! AND I SURE  
DON'T WANT THAT  
NIGHT CLASS  
ROUTINE IN  
THE CITY!

WHY NOT STUDY  
AT HOME?...THE  
WAY DAD DID...  
WITH I.C.S.



JANE SHOWED ME AN I.C.S.  
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- ☐ Arch. Drawing and Designing
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- ☐ Carpenter Builder
- ☐ Carpentry and Millwork
- ☐ Heating
- ☐ Painting Contractor
- ☐ Plumbing
- ☐ Reading Arch. Blueprints

### ART

- ☐ Commercial Art
- ☐ Magazine Illus.
- ☐ Sign Painting and Design'g
- ☐ Sketching and Painting

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- ☐ Automobile
- ☐ Auto Body Rebuilding and Refinishing
- ☐ Auto Engine Tuneup
- ☐ Auto Electrical Technician
- ☐ Diesel Engines

### AVIATION

- ☐ Aero-Engineering Technology
- ☐ Aviation Engine Mech.
- ☐ Reading Aircraft Blueprints

### BUSINESS

- ☐ Accounting
- ☐ Advertising
- ☐ Bookkeeping and Cost Accounting
- ☐ Business Administration
- ☐ Business Management
- ☐ Clerk Typist
- ☐ Creative Salesmanship
- ☐ Managing a Small Business
- ☐ Professional Secretary
- ☐ Public Accounting
- ☐ Purchasing Agent
- ☐ Real Estate Salesmanship
- ☐ Salesmanship
- ☐ Salesmanship and Management
- ☐ Traffic Management

### CHEMICAL

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- ☐ Chemical Engineering
- ☐ Chem. Lab. Technician
- ☐ General Chemistry

- ☐ Oil Field Technology
- ☐ Pulp and Paper Making

### CIVIL ENGINEERING

- ☐ Civil Engineering
- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Professional Engineer (Civil)
- ☐ Reading Struc. Blueprints
- ☐ Sanitary Engineer
- ☐ Sewage Plant Operator
- ☐ Structural Engineering
- ☐ Surveying and Mapping
- ☐ Water Works Operator

### DRAFTING

- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Drafting & Machine Design
- ☐ Electrical Drafting
- ☐ Electrical Engineer Drafting
- ☐ Industrial Piping Drafting
- ☐ Mechanical Drafting
- ☐ Sheet Metal Drafting

### ELECTRICAL

- ☐ Electrical Appliance Servicing
- ☐ Electrical Engineering

- ☐ Electric Motor Repairman
- ☐ Elec. Engr. Technician
- ☐ Elec. Light and Power
- ☐ Practical Electrician
- ☐ Practical Lineman
- ☐ Professional Engineer

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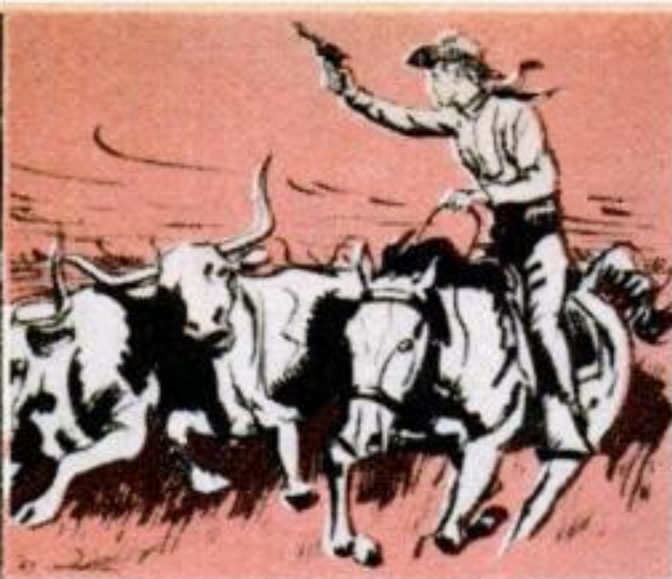
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**Four-Speed box:** *It's now back in the family sedan. P. 62*

**Sam Colt:** *His revolver made men of the West equal. P. 88*

**Coyotes:** *Hollywood has them in packs. P. 68*

*Founded in 1872 Vol. 179 No. 6*

*Popular Science®*

# Popular Science

**December, 1961**

*Cover photo by R. D. Borst*

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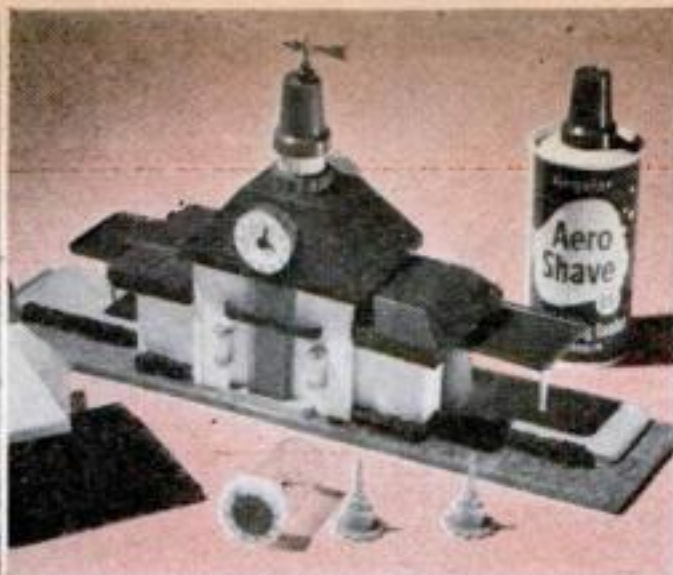
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**Plastic discards: Save them. Why? Here's the answer. P. 110**



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## TALK BACK



Mr. Hodges belted in his T-bird.

### Rolling Toward Safety

POPULAR SCIENCE is to be commended for focusing attention on the need for safer vehicles ["Let's Get Rolling on Car Safety," Sept., p. 45]. This is part of the whole complex question of highway safety, to which the U.S. Department of Commerce is giving serious study.

Roads, of course, are only a part of the safety picture. A safe vehicle is very important. We are particularly interested in the fact that your article highlights seat belts as the number-one requirement, since I have directed that all cars and trucks operated by our Department be equipped with seat belts as rapidly as possible.

Effective control of drivers is another factor. Here we believe we are making a valuable contribution with our new National Driver Register. The Register will list motor vehicle operators whose licenses are withdrawn for driving while intoxicated or for conviction of a violation involving a traffic death. The Department will make information from this file available to State Motor Vehicle Administrators on request.

But government alone cannot do the job that needs to be done. The motorist has the final say on some crucial phases of the safety problem.

As a car-buyer, you can insist on safety features. We must become more realistic consumers. I have seat belts in my personal automobile, I have urged all Commerce employees to put them in their own cars, and I urge every reader of this magazine to do likewise.

As a citizen, you can insist on meaningful safety legislation. Even if we manufactured the safest possible cars, periodic inspections would be necessary. Does your state require regular checks of brakes, lights, steering, and other key items?

As a driver, you can exercise the same care and courtesy on the road that you would like to see the "other fellow" show you.

Highway safety is everyone's business. Let's all work at it.

LUTHER H. HODGES,  
Secretary of Commerce  
Washington, D.C.

... I MOST certainly would like to express my admiration for a job very well done.

DANIEL P. MOYNIHAN,  
Special Assistant to the Secretary  
of Labor, Washington, D.C.

... IF SOMEBODY would each month tell which automobile has the most fatalities in relation to that car's popularity, don't you think the manufacturer would promptly add safety features?

After one auto was listed as most dangerous the manufacturer would make it safer. Eventually all hazards would be eliminated.

DAVID WILBER, St. Louis.

The South Carolina Junior Chamber of Commerce (Sumter, S.C.) is already campaigning for a governmental listing of this kind.

... I INSTALLED belts in my car, not as a



result of your article, but because of my own misdemeanors. Driving in a built-up area, I allowed my mind to wander, went through a stop street, and hit a truck. Even at 30 m.p.h. I cracked the windshield with

►► Because of our growing volume of mail, it is not possible for our staff to answer or acknowledge individual inquiries except those published in these columns.





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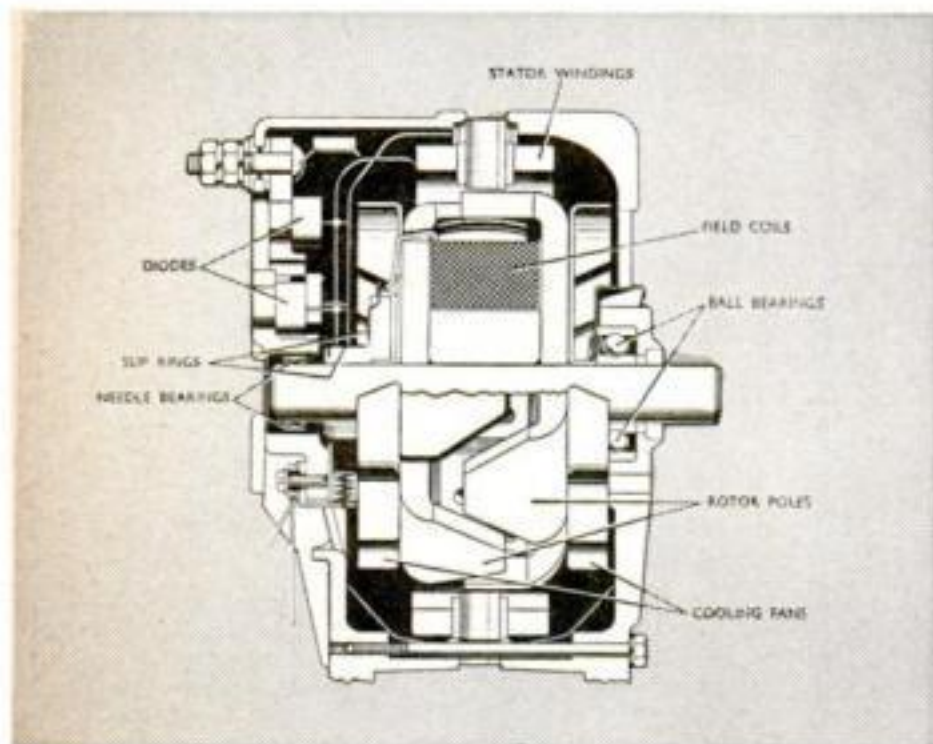
Yes, if you are really sincere in wanting to better your position—start your income climbing—enjoy a lifetime career of high standing and high reward—this friendly staff of experts can help you.





# Test your

## QUICK QUIZ BY QUAKER STATE



1. Can you name this successor to the generator?



2. What does this symbol stand for?

The symbol stands for Quaker State Motor Oil—world's best engine life preserver. Proved in labs and on the road to give peak protection for modern engines, Quaker State is refined from 100% pure Pennsylvania Grade Crude Oil. Insist on Quaker State—sold most everywhere. For your dealer's name, call Western Union Operator 25.

ANSWERS: 1. Alternator, now on all 1961 Chrysler Corp. cars.

2. World's finest motor oil.



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QUAKER STATE OIL REFINING CORP., OIL CITY, PA.

my forehead. I paid the damage (and the fine) while trying to think of some way of kicking my hindquarters up to my shoulders.

ERNEST J. FINN, Toronto.

... YOUR September issue was one of the best. I wrote my congressman about the auto safety article.

ALAN PIER, Syosset, N. Y.

... FIRST you have a fine article about car safety. Then eight pages later you point out as a good feature on the new Renault the gearshift right smack in the middle of the dash.

It looks like a big fat pig sticker to me.

A. W. BARNWELL, Chatham, Ont.

### Backtalk to Detroit

THE reply by the Automobile Manufacturers Association ["Auto Makers Answer Back on Car Safety," Oct., p. 89] lists "four fallacious assumptions," all of which are, on the contrary, only too true:

1. The knowledge for building safer cars is close at hand. The problem is to overcome public apathy and the shrieks of dissent from the styling department.

2. Vehicle redesign is one of the best means for achieving safety because it results in a nationwide decrease in casualties, not just in Connecticut or Chicago. Many communities do not have the organization to handle safety programs. A combination of a nationwide safety program *plus* safer automobiles should be our aim, not a choice between the two.

3. The industry is failing to emphasize safety—because safety has little sales potential compared to blobs of snazzy chrome or



the multi-square-inch "safety-glass" passenger compartments (better known as America's most widely traveled rotisseries).

4. Federal regulation of car design is, at the moment, the only answer because the industry has been unwilling to produce cars as safe as they can or should be made.

Nowhere in the paragraph on the auto death toll does the AMA deplore the fact that 38,000 people (the population of a medium-size city) are being mercilessly slain every year. I suppose that 38,000 angry customers worried about any sparsity of chrome would worry the industry more than 38,000 dead people. In dealing with its obvi-

CONTINUED



LE MANS 

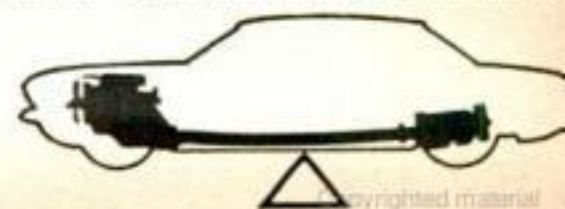


# Call it the *Tempest LeMans!* (Luh-mahnz)

*Pontiac's new package of punch...posh...and low price!* Convertible or Coupe! A couple of fancy, frisky newcomers. Pull the trigger on a fired-up "4". (Standard power: 110, 115, 120 or 140 h.p. Optional at extra cost: 166-horse "4"; 190 h.p. aluminum V-8; four-speed, floor mounted stick shift.) Plush, sports type bucket seats and full carpeting are part of the package. Plenty more. Front engine balanced by rear transmission. Independent suspension at all four wheels. Big 15-inch wheels and tires (at no extra cost). Get the good word from your Pontiac dealer. He's very high on the car and very low on the price.

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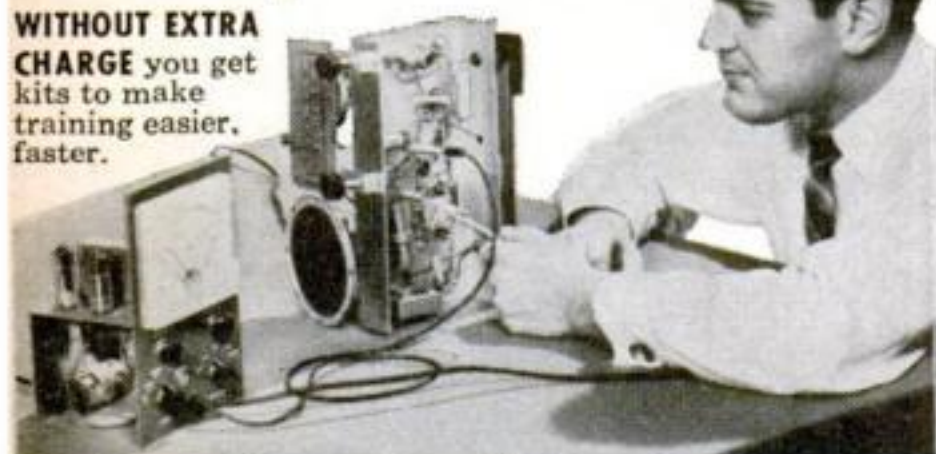
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**Broadcasting.**  
"I am now chief engineer of Station WARA. NRI was the foundation." R. ARNOLD, Attleboro, Mass.



**Industrial.**  
"Four months after starting your course I went to work at Raytheon. Now I am an engineering assistant in Microwave Power Tube Research." L. J. BLOOM, Newton Centre, Mass.

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ous problems, the AMA does little but imply its incompetence (even more reason for Federal regulations).

STEPHEN H. KAISER,  
Massachusetts Institute of Technology,  
Cambridge, Mass.

. . . . HAVING just finished reading "Auto Makers Answer Back on Car Safety," the arguments for a safe car which are pointed up in Gov. Farris Bryant's speech apply directly to manufacturers.

The governor of Florida, in an address this fall, said: "Are the results of university and laboratory studies on safety being disregarded by automotive manufacturers? Let us undertake a campaign to encourage them to build cars for today's needs."

I'm for Governor Bryant's position.

ALBERT A. BRESSLER, Jacksonville, Fla.

. . . . SAFETY is not a relative term to me. It may be hard to believe but there are people who would prefer a padded dash and better brakes to fins three feet high. You can't convince me that Detroit is doing what they can for car safety. I've seen too many serious accidents that could have been only minor ones if a few safety features had been included.

FRANK DEMARIA, Richmond, Ohio.

. . . . I DISAGREE on one point in Detroit's answer on safe cars. It says:

"There is a big need for public education—and in this field the industry is cooperating wholeheartedly."

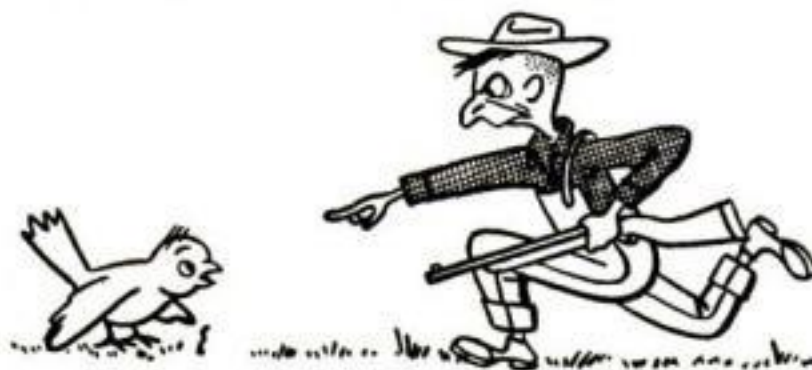
Why, then, does the industry show photographs—in advertisements, brochures, posters—of cars not equipped with seat belts? This is a great force for public persuasion.

Omitting the belts from the pictures only says to the public, "We in the industry don't think belts are necessary."

DONALD S. BOWMAN, Pastor  
The Methodist Church, Brookston, Ind.

### The Starling Problem

IF THE birds ruin farm crops ["Starlings: Public Nuisance No. 1," Sept., p. 66], man



has brought it on himself. Farmer, fruit grower, and cattleman are so greedy that they've cut down every hedgerow to increase their acreage, depriving birds of nesting places as well as food supply. The counties

CONTINUED



# Here are 3 good reasons

*why I'm glad*

*I became a* **DURACLEAN DEALER**

Raising a family takes a dependable, steady income. Too few jobs offer security and chance for advancement. That's why so many men are going into a business of their own. All around us are local merchants making a good living in respectable businesses where they hold a franchise. The big questions are "What is left to go into?—Which business is profitable?—Which requires only a modest investment?" Many have found the answers in DURACLEAN.

## **EVERY TOWN NEEDS THIS AMAZING BETTER HOME CLEANING SERVICE**

Duraclean is a scientific method of cleaning carpeting and upholstery in the home. This better process of cleaning by absorption virtually "lifts" the dirt from fabrics, leaves them bright and lively. Almost every home, hotel and many offices are potential customers who will call you again and again.

### **Check Experience of Other Dealers**

There's no better way to learn of DURACLEAN profit opportunities than by checking with dealers already in business. If there's one near you, call him—or ask DURACLEAN whom to call.

#### **M. LYONS: ILLINOIS**

"Averaged over \$50,000 my first 3 yrs. Headquarters' help makes it possible".

#### **C. RANDALL: OHIO**

"My 2nd year and business keeps growing. Have made as much as \$120 in one day".

#### **E. BAILEY: ARKANSAS**

"I know of no other business which can offer so much".

#### **L. LAWSON: NEW YORK**

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DURACLEAN headquarters supplies all equipment and chemicals to put you in business. Regularly held training sessions, cover techniques, methods and means of developing business. Local advertising helps and merchandising ideas are available; and an impressive national advertising program pre-sells customers on the gentle DURACLEAN cleaning process.

Start part time, full time or hire others. **NO SHOP NEEDED.** DURACLEAN service is rendered in the home or customer's place of business. Just 2 average jobs a day can net \$8,750.00 a year.

## **MORE WAYS TO MAKE MONEY**

5 other DURACLEAN services multiply your profits. DURASHIELD soil retarding service, DURAPROOF mothproofing and DURAGUARD flame retarding are among the other services that mean more money for you. It takes less money to establish this prosperous business. No wonder so many men with vision are becoming DURACLEAN DEALERS. Why don't you? Write today for FREE booklets.

### **MAIL THIS "FUTURE SECURITY" COUPON**

#### **DURACLEAN COMPANY**

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*Here are just a few of the features:*

- Check transient response and dynamic range
- Explore the personality of orchestral instruments
- Test bass response with actual music
- Shows how the high frequencies give realism to music

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and towns are guilty also because they have cut down roadside hedgerows. There are few wild cherries, blackberries, chokecherries, currants, or elderberries left.

Bluebirds have been decimated in many places due to pesticides. Chickadees, warblers, nuthatches, and endless other varieties have suffered alarming declines in numbers. A bird dare not alight in a farmer's field to even look for an insect without being poisoned—or shot to death.

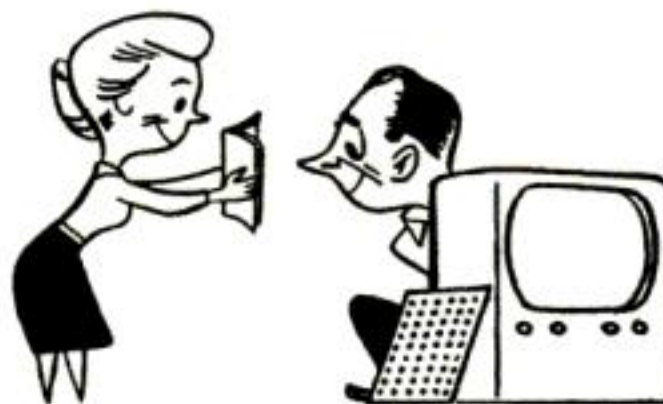
H. F. HERBER, Ivesdale, Ill.

... SINCE starlings are such a danger to jet aircraft, why can't the jets be provided with screens or grilles set at an angle to cause the birds to slide off instead of being pressed flat against it? It would be easier than trying to exterminate the starlings.

H. LANDAUER, Tampa, Fla.

**TV Repairs Made Easy**

LAST Sunday the picture went out on our TV set. Tuesday I received the September PS. "On the Trail of No Raster" [p. 119]



helped me to fix it quickly and get a better picture than we had been getting previously.

G. L. HOLLAND, Chattanooga.

**Word from the Southpaws**

I FOUND "It's a Clumsy World for Lefty" [Sept., p. 103] 99-and-44/100-percent informative. I have one correction:

You say of left-handers: "Not until two years ago was there a rifle or shotgun designed especially for them." About seven years ago I purchased one. It is a model 44 U.S. .22-long-rifle made by O. F. Mossberg & Sons.

At the time I appreciated their consideration for the southpaw, and I'd like to repay their efforts now.

L. J. MAIERHOFER, Bedford, Pa.

... I'M right-handed, but I've always had a bad right eye, very good left eye. When I enlisted in 1915, until discharge in 1927, every round I fired was from the left shoulder. This includes being Number One on a Lewis gun.

During the yearly musketry course—when top scores meant extra pay—I concentrated on getting seven good shots off in the 10-rounds-a-minute shoot because I had to





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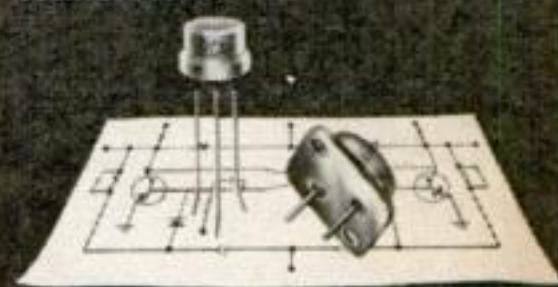
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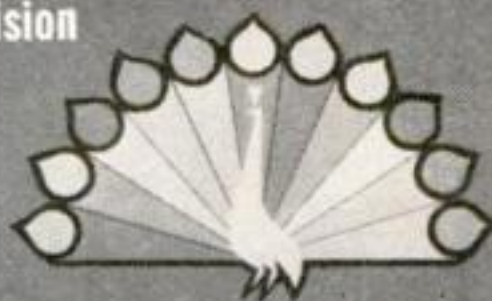
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move my Lee-Enfield from the target each time to reach over with my left hand to reload. In the last eight of my yearly courses, I finished up as very good or excellent, thus ensuring an extra sixpence a day. I never saw a scope sight till I came to this country.

JOHN WEBSTER, Collingswood, N.Y.

... I AM a lefty and it doesn't bother me. Why do all the articles on the subject make it look as if all lefties are clumsy jerks? Some things may give us trouble; but life is not as bad as you say.

KENNETH WASHENMILLER, Indianapolis

### Compact Hint for Compact Shop

YOUR idea for stabling a compact car and a shop ["Compact Car—Compact Shop," Sept., p. 152] is good. But what if you need to get under the hood with the car in the garage? If the bench were on rollers or had a hinged top, it might prove more practical.

CHARLES KERIN JR., Hingham, Mass.

### Car Thieves Beware

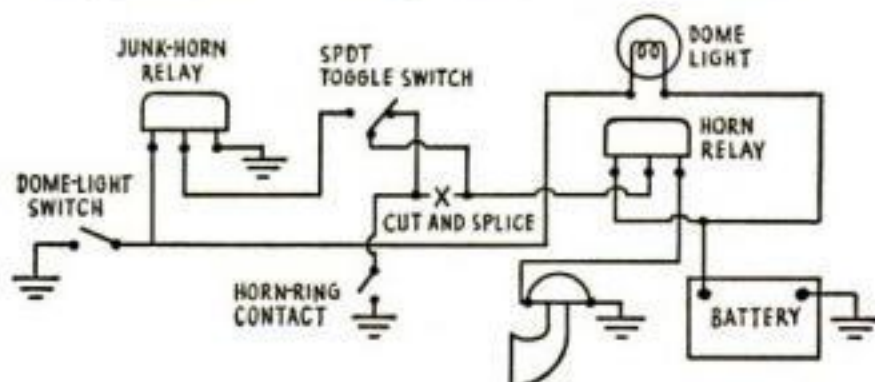
I MADE the burglar alarm for cars ["Hints from the Model Garage," Sept., p. 198] and it works. But it didn't quite suit me. I added a 15-amp fuse and an ordinary flashlight unit between the toggle switch and the horn. That protects the flasher and really makes the alarm. The steady blast can easily be

mistaken for a stuck, or shorted, horn. The flasher changes that.

Then I went further. I took a door switch from a junker and put it under the hood where it actuates the alarm as soon as the hood is unlatched. I'm told that professionals look there first for a "hidden" key.

E. H. DAVY, Gardner, Ill.

... WITH that burglar alarm, all a smart crook would have to do is hop in, close the door, and tap the horn ring once. This would shunt (ground on both sides of the wiring) the junk horn relay and silence the horn.



I've made no tests, but it would seem to me that I have an improved circuit.

JACK STEIN, San Pedro, Calif.

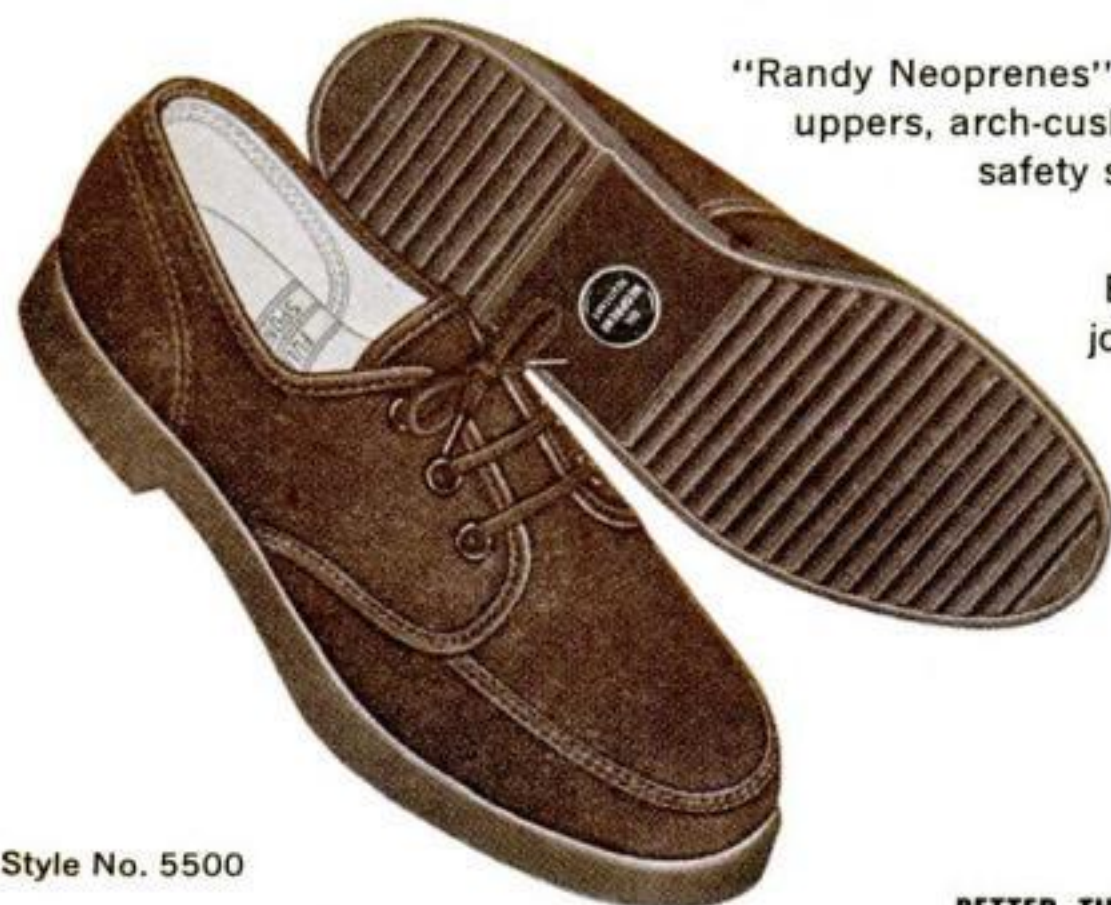
### Tire Rotations the Easy Way

FOUR tire rotations per year ["Why Let Your Snow Tires Loaf?" Oct., p. 179] are more than would be needed for cars driven

CONTINUED

LOOKING FOR LONG WEAR IN CANVAS CASUALS?

TRY *Randy* CASUALS  
WITH **NEOPRENE SOLES!**



"Randy Neoprenes" offer a new combination of formfit canvas uppers, arch-cushioned comfort and long-wearing neoprene safety soles. These washable casuals are ideal for work or play, indoor and outdoor wear.

Exceptional durability, even under toughest job conditions, is assured by the oil, grease, chemical and weather resistance of neoprene soles. That's why more than 75 million pairs of work and safety shoes have been made with neoprene soles.

*Ask for neoprene soles  
the next time you buy shoes.*



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

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*the most exciting road and racing set in the world!*



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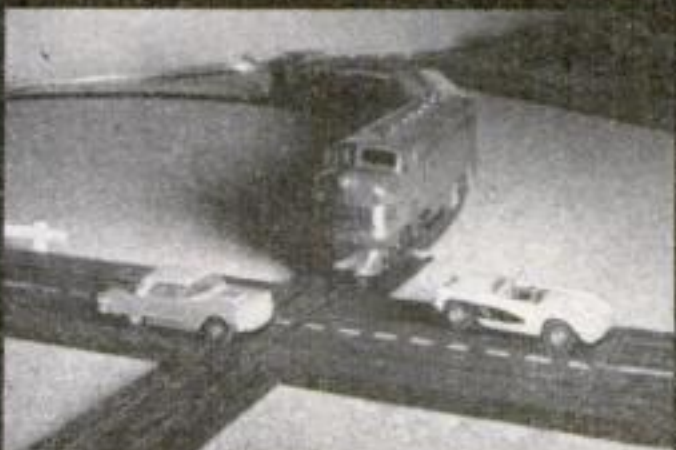
ACTUAL SIZE



Down goes the green flag and they're off —zooming along the straightaway at 150 scale mph! Watch it... here comes a hair-pin curve. Hit that bend at top speed and you're a spin-out for sure! MODEL MOTORING IN HO SCALE is the ultimate in table-top racing, gives you twice the action in half the space, lets you re-create any race course in the world. For the model railroading fan, it's a natural — build it right into your HO train layout. Add a Grade Crossing and get set for hit-or-miss action right out of a Hollywood movie. Choose from 5 complete sets — \$16.95 to \$49.95. All MODEL MOTORING equipment is open stock — add extra track for "professional" 4-lane competition; pick additional racing cars from a wide assortment of models; new 1962 passenger cars and trucks also available. Test-drive it now — at hobby dealers, toy, variety, and department stores everywhere!

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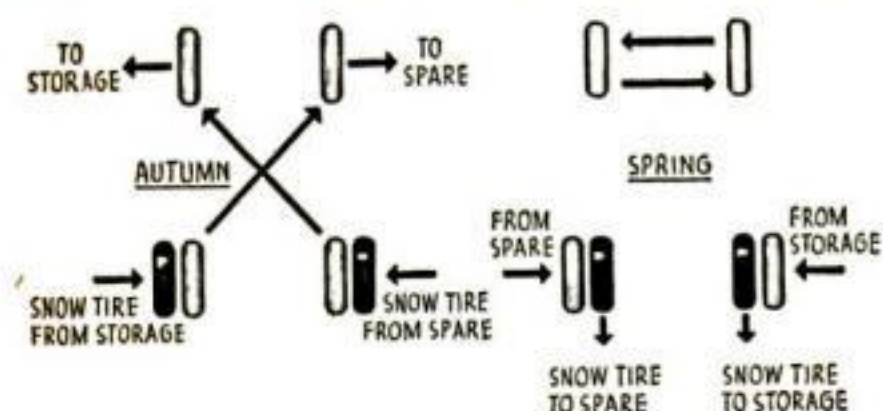
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AURORA PLASTICS CORP. ☐ DEPT. AD7 ☐ WEST HEMPSTEAD, L. I., NEW YORK





less than 10,000 miles per year. Effort could be saved in such cases by using a scheme calling for only two rotations—at the times of installing and removing the snow tires.

A tire would start out in spring at left rear, move to right front in fall, to left front



the next spring, and to storage in the fall. The following spring, the tire would begin a new cycle on the right rear. A snow tire will spend all winter on one side and go to the other side for the following winter.

CHARLES E. COHN, Chicago.

### "Runaway Engine" Gets Away

THE author of "Runaway Engine on the Main Line" [Oct., p. 127] says that the runaway, Engine 1706, was a Fairbanks-Morse diesel-electric locomotive. The picture on page 128 shows an American Locomotive General Electric product—an Alco.

The "catch" or "stop" engine, number

1506, was correctly labeled a Fairbanks-Morse in your fine story.

T. J. JOHNSON, Asheboro, N.C.

### M60 No Economy-Run Winner

READING Erik Miller's report on the M60 ["The World's Toughest Tank," Sept., p. 82] brought back memories—pleasant and otherwise. While living with an M48 for 21 months I learned how a turtle must feel.

I wonder if Miller was shown one of the best assets for maneuvering 1,600,000 ounces of iron in closed terrain. Through the use of neutral steer, the driver can amble to a position and turn completely around and return in his same tracks without moving an inch (literally) to either side. It should not be tried on soft surfaces or the crew will be cussing the driver while they replace a thrown track.

But I defy anyone to get 320 miles out of a full load of gas (375 gallons). I don't care what the manual says, it just doesn't happen! I remember times when I took jaunts of not even 10 miles and back and refueled with 100 and more gallons. Those 12 wells just drink, and drink, and drink.

CECIL KELSEY, Peru, Ill.

... You make no mention of infrared sighting devices for night fighting, so I pre-

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Sworn statement from CHAS. LEMMING reads:

"After starting my own business



I've averaged \$100 A DAY —most of it clear profit!"

• If you want to be independent—free from lay-offs, bosses—start profitable, year 'round business of your own. Ours is NOT a lease proposition. You own the machine, you work when and where you please, and all the money you take in is your own. FREE book tells you how.

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Without obligation rush your FREE booklet about how I can start my own permanent, profitable electric Upholstery Cleaning business.

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Not everyone does as well...

Mr. Lemming owns two machines

In city of less than 50,000, Mr. Lemming started his own business after filling in coupon like one below. He averaged \$100 a day during first year, some days \$200. F. E. Doran grossed \$1050 in single month. Geo. Held grossed \$300 in one week.

How much you earn depends largely on you. No special skill, no large investment required for our electric upholstery cleaning machine. Start spare time until full time justified. Hire helpers as needed.

**NO SHOP NECESSARY** • You clean upholstered furniture on customers' premises—homes, hotels, motels, etc. Auto upholstering, too. No hauling; operate from your home. Watch business grow as satisfied customers tell friends. Supplies cost little, profits high.



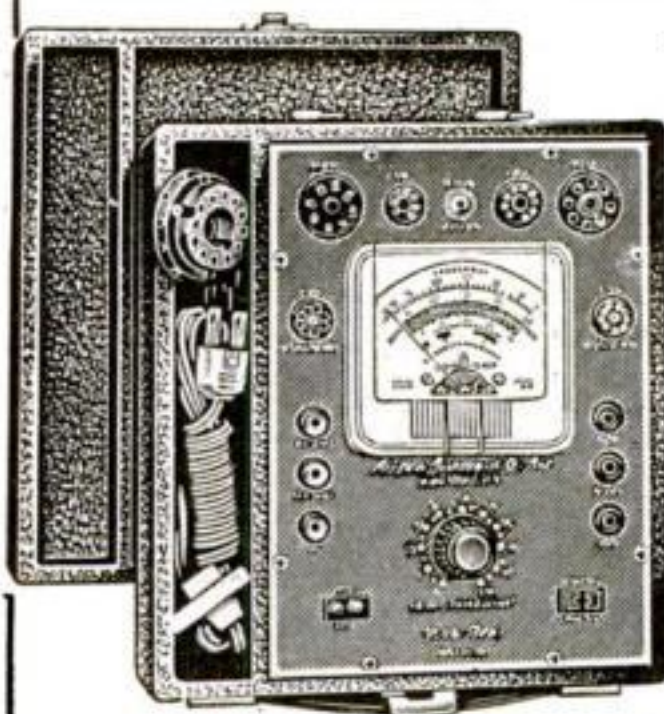
# New Model 161 UTILITY TESTER® FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES

As an electrical trouble shooter the Model 161:

- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermostats, etc.
- Will test all TV tubes (including picture tubes) for open filaments and burned out tubes.
- Measures A.C. and D.C. Voltages, (Both 110 Volt and 220 Volt lines).
- Will measure current consumption (amperes) while the appliance under test is in operation.
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.

As an Automotive Tester the Model 161 will test:

- Both 6 Volt and 12 Volt Storage Batteries • Generators • Starters • Distributors • Ignition Coils • Regulators • Relays • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fuses • Heating Systems • Horns • Also will locate poor grounds, breaks in wiring, poor connections, etc.



**IT'S SO EASY!!**



with tester's cord in outlet, current consumption of appliance is read direct on meter when line cord is connected to receptacle on panel. This typical iron takes 7 amperes (Good).



Simply insert tube in appropriate socket then follow procedure as outlined in our manual.



Control circuits of most furnaces use 24 volts obtained from step-down transformer. Here's how to check room thermostat to see if wires to it are live.



Small electric fan motor indicates 50 ohms (normal resistance).



Test Generators  
**READ THIS!**



Test Storage Batteries  
**READ THIS!**



Test Circuit Breakers  
**READ THIS!**



**INCLUDED FREE!!**

This 56-page-book—practically a condensed course in electricity. Learn by doing.

Just read the following partial list of contents:

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- How to test all TV tubes; also simple procedure for determining which specific tube (or tubes) is causing the trouble.
- How to trace trouble in the electrical circuits and parts in automobiles and trucks.

Model 161 comes complete with above book and test leads. Only **\$22<sup>50</sup>**

You don't pay for the Model 161 until AFTER you have examined it in the privacy of your home!

## **SEND NO MONEY WITH ORDER** **PAY POSTMAN NOTHING ON DELIVERY**

Try it for 10 days before you buy. If completely satisfied then send \$5.00 and pay the balance at the rate of \$5.00 per month until the total price of \$22.50 (plus small P.P. and budget charge) is paid. If not completely satisfied, return to us, no explanation necessary.

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Please rush me one Model 161. If satisfactory I agree to pay \$5.00 within 10 days and balance at rate of \$5 per month until total price of \$22.50 (plus small P.P. and budget charge) is paid. If not satisfactory, I may return for cancellation of account.

Name \_\_\_\_\_

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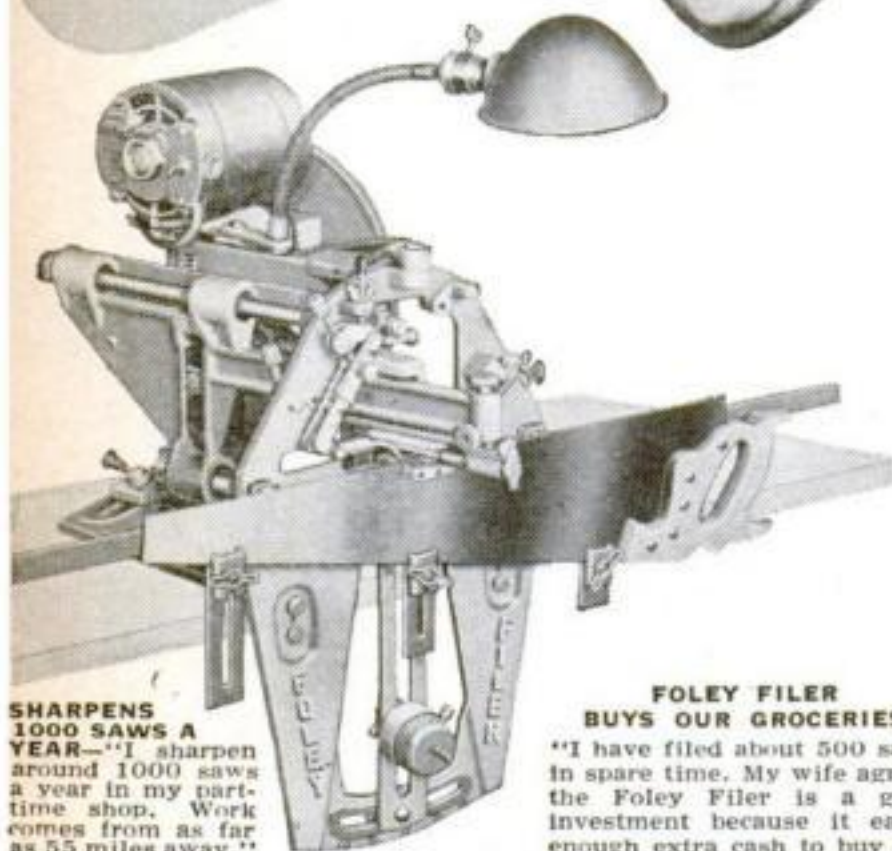
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comes from as far  
as 55 miles away."  
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the Foley Filer is a good  
investment because it earns  
enough extra cash to buy our  
groceries." — R. J. Kreuser.

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sume the M60 is not so equipped. I understand that most other countries do so equip their fighting machines.

If all this is so, I'd like to ask the War Department a question: Doesn't this make the "World's Toughest Tank" no more than a blind sitting duck in the dark?

STEVE SATCHEL, E. Sparta, Ohio.

### Western Omelet

EXPLAIN to this befuddled reader what happens when the automatic grocery packer ["New Ideas from the Inventors," Sept., p. 79] puts the plums, tomatoes, and eggs on



the bottom, and the cans and bottles on top. The cashier would be too busy to sort and arrange the items as the dependable clerk at the end of the counter does.

CARL ULMER, Chatham, N.J.

### Big "Beetles" Invade Canada

WE WERE very pleased to read your informative article on the new VW 1500 [Sept., p. 74]. We'd like to point out, however, that while there are no plans at present to import this car into the U.S., it will be sold in Canada. The first cars are expected to be ready for sale next spring, following our usual policy of preparing parts and service facilities first.

PHILIP MURRAY

Volkswagen Canada Ltd., Toronto.

... YOUR cynicism regarding the VW 1500 was misplaced. First: Styling is more closely related to Italy than to Detroit. Second: The car is better built than any Detroit car, compact or mammoth. (This is what distinguishes it from others.) Third: Many VW ideas (torsion bars, synchromesh transmissions) have found their way into Detroit cars.

Incidentally, how do you tell an Opel, Simca, Falcon, Comet, Lark, F-85, Tempest, or Valiant from each other?

GARY PENN, Orange, Tex.

### The First JFK Rocker?

IN THE handicraft section you gave plans for a rocking chair ["Making Your Own Kennedy Rocker," Aug., p. 118] supposedly originated by W. C. Page. Our local hospital, built in 1914, had as part of the original fur-



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Almost 100 pages and 348 pictures—the most comprehensive section of its kind ever published—show how to service and repair modern carburetors and fuel injectors.

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nishings a rocker very similar in appearance. It is still rocking away and the only difference between it and the Page rocker is that it has a slat back. The seat is woven. Since this rocker is very nearly as old as Mr. Page, how come he originated it?

CHARLES MCPHERSON, Glace Bay, N.S.

*You have misread us. The story says that Mr. Page is the manufacturer of the "original chair." By original chair is meant the chair owned by the President.*

#### Miles Per Error

I THOROUGHLY enjoyed your reports on the '62 automobiles, especially the one on the Buick engine ["Wringing Out Buick's New V-6," Oct., p. 82]. On the first refill, you indicated 277 miles of travel on 11.7 gallons of gas. My calculations indicate 23.67 m.p.g. rather than 19.4. Am I right?

DON J. SCHUTZ, Cotati, Calif.

*Your arithmetic is right. Somewhere between the log book and printed page 227 miles became 277 miles.*

#### Ten Lashes with a Resilient Hot Dog

I'VE just read with great amusement of the Brooklyn butcher who manufactures circular frankfurters ["PS Picture News," Oct., p. 112]. Would it be possible that after the first bite it would spring back to its normal shape?

GERALD SCHLISSEL, Arverne, N.Y.



... ANYONE that lives within 100 miles of Brooklyn wasn't fooled into thinking that ring-shaped wiener was meant for a hamburger roll. Definitely, it will nestle softly between the two halves of a brittle, crunchy tasty bagel. For the education of outlanders in the prairie areas or our 49th state, the Jewish bagel is shaped like a doughnut and traditionally clasps cream cheese and smoked salmon between its halves.

J. K. WEST, Newark, N.J.

#### Case of the Wrong-Way Fan

I, TOO, had trouble with a "wrong-way fan" [Oct., p. 182]. In my case, the motor shorted and was declared too expensive to rewind.

I tested all the replacement motors in the store that suited my purpose. All of them had the wrong (for me) direction. But I bought one and managed to adapt it to the old fan stand and blade-guard mounting. To correct the fan pitch for the reverse direction, the blade was slipped on a 5/15" bolt.

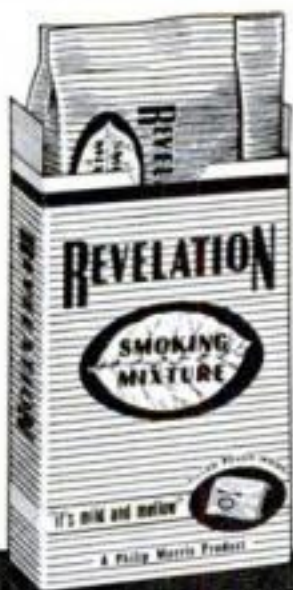




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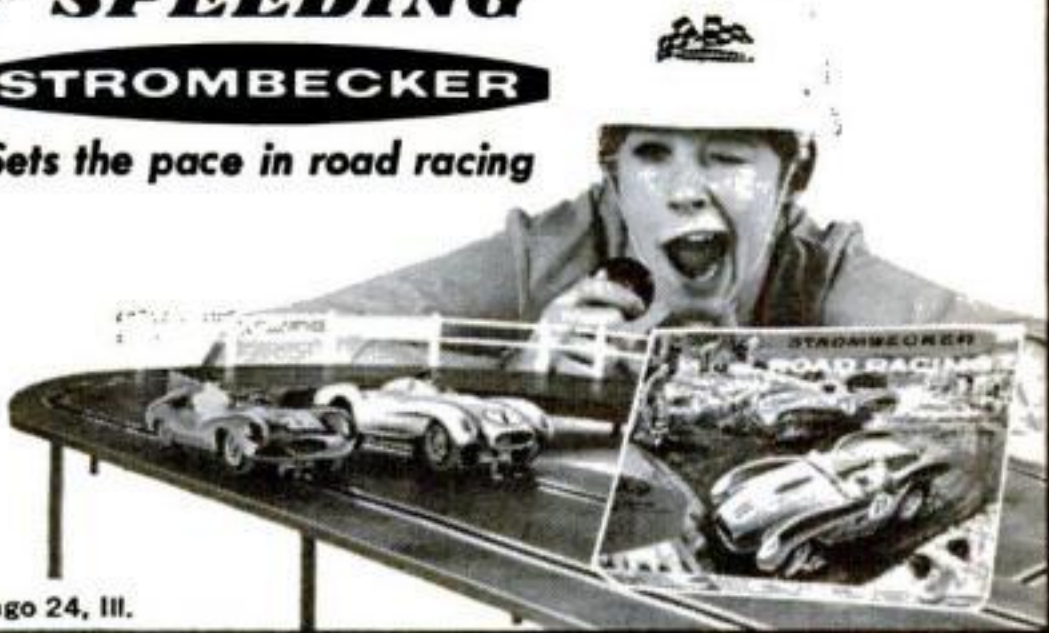
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the head of which was inserted in the vise jaws. Thus secured, the spider frame members of the assembly were slowly bent in reverse order, one at a time. A gauge set up on the bench top indicated when all blade tips were in alignment. Then the fan was removed from the bolt and laid face down on the bench top where, by use of a surface gauge, each blade's curvature was checked in turn until all were identical as to pitch, tip to base.

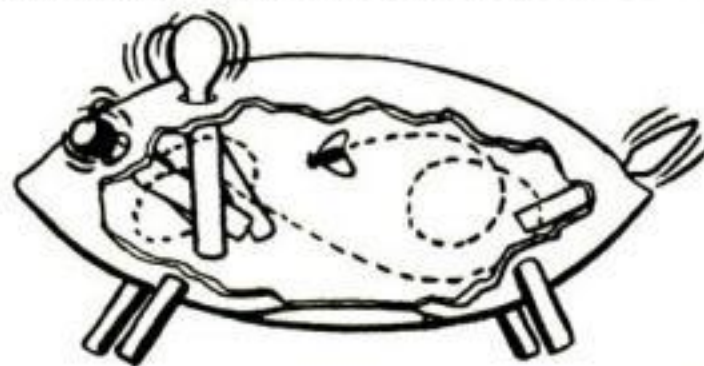
Reorienting the shaded-pole field unit wouldn't have proved practical because of the presence of baked-on Glyptal—too difficult to chip away without damage to the coils.

PAUL C. ZIEMKE, Clinton, Tenn.

### Secret of the Magic Pig

ARE any of your readers familiar with "magic" pigs? They're made of large pecans, and the eyes roll, the tail twitches, and the ears wiggle while you watch. The secret of the magic is a common fly crawling around in the hollowed-out shell.

To make one, cut a hole in the center of a large nut, making it big enough to dig out the meat inside. Drill small holes for eyes,



ears, tail, and legs, using a 1/8-inch or smaller drill. The eyes are beads on wooden pins. Cut moving parts a little oversize for a push fit, but with a smaller neck at the section that touches the shell. This will allow them to wobble easily when disturbed by the fly. Pop a fly into the shell and cover the hole with masking tape.

PAUL D. BREY, Ontario, Wis.

### Gold-Plated Shovel, Yet

AFTER reading "The Right Shovel for the Job" [Oct., p. 138], I thought you'd be interested in this little anecdote:

For over 50 years our company has always given the President of the United States, on taking office, a gold-plated shovel. In the case of Mr. Kennedy, we sent him a beautiful gold-plated round-point D-handle shovel with the proper lift, for tree planting and other dedications. The shovel was returned by one of his secretaries with a very nice letter stating that he did not accept gifts of any value and that this was the new administration's policy.

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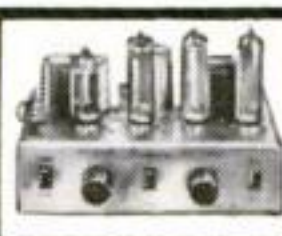
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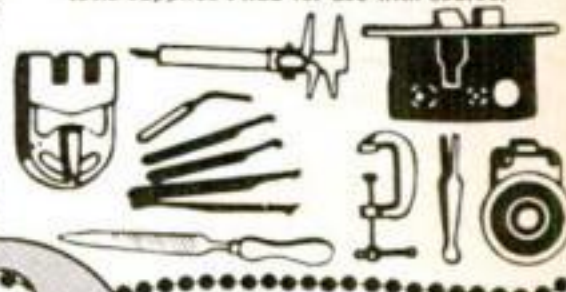


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Ottawa and this was attributed as the cause of his backache. We saw the picture and saw that the spade was an English spade with no lift at all. We again wrote him a letter offering him the shovel with the proper lift so he would not run into the possibility of getting backaches; and this time there was no answer at all.

B. B. WOOD, executive vice-president  
Wood Shovel & Tool Co., Piqua, Ohio.



### Late Starter Comes Through

I JUST finished this pine bookshelf desk from plans you published a long time ago [Sept. '59, p. 208]. I changed the hutch top slightly, leaving the back open and substituting small drawers for the original cubbyholes. It cost me \$34.73—very reasonable

when compared to the cost of Early-American furniture today.

JOHN BOHN, Shelton, Conn.

### New Four-Speed Automatic

TELL Martin Huikko ["PS Readers Talk Back," Sept., p. 4] that several states have laws against freewheeling automobiles. Thus he'll be denied a four-speed shift with the specs he outlines.

However, he may be interested to learn that a four-speed automatic transmission with the same efficiency as a manual transmission is under development. It has no hydraulic torque converter and provides direct drive in fourth. It also has a first speed with a somewhat higher gear ratio than usual to provide the rapid acceleration Mr. Huikko wants.

H. G. DIVER, Springfield, Ohio.

### To Measure or Not to Measure . . .

I DON'T agree with that tool man ["PS Readers Talk Back," Sept., p. 4] that a distrust of measuring devices is foolish. In eight years making my living in machine shops and four years with carpentry for a hobby, I've always noticed that the old-timers with a real feel for the work always take a direct, positive comparison (or measurement, if you will) wherever possible.

Say you're boring a bushing, and turning a shaft to fit it and turn freely but with no detectable slop. Using a good lathe and the best carefully checked mikes, you'll never know that you've hit it just right without an actual trial.

One of my books on house framing recommends that the bottom plate of a wall or





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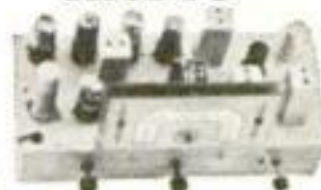
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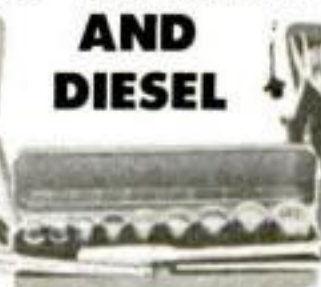
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partition be laid out for each stud, laid in place to double-check, and then the top plate put on top to make a direct transfer of the layout to it. Well, I thought any half-witted machinist could make a simple partition without this rigamarole. But I discovered that the positive-comparison method eliminates the funny-looking partition often resulting from the straight-measurement method.

As for folding wood rules: With all the defects of the pocket tape rule, I've built a house with one. But I couldn't make a bird-house right with a folding rule.

HUBERT LEES, San Francisco.

### Just a Theory?

WHENEVER an article deals with the beginning of time, evolution is mentioned as a common fact without the slightest hint that evolution is actually just a theory, and a poorly supported one at that. See the piece on the man-horse from outer space ["The Month in Science," Oct., p. 19]. Those who are not afraid to think for themselves and examine the available facts find that there are so many gaps in the theory it is difficult to comprehend how it got so far in the first place.

Prof. H. H. Newman of the University of Chicago says, "Reluctant as he may be to admit it, honesty compels the evolutionist to admit that there is no absolute proof of organic evolution." Who, then, are you to present evolution as a fact?

R. H. PATTERSON, Peterborough, Ont.

*We also believe in atoms and radio waves, without ever having seen them. But we'll try to keep our minds open and remember that they, like evolution, are only theories subject at any time to replacement by better ones.*

### Vicuna for Sale

JUST read about that \$10,000 horse blanket, ["PS Picture News," Sept., p. 106], the prize for "the horse of the year." I have a pure vicuna handmade poncho, made by the natives in Peru about 1908. My father was working for a mining company in the Andes and bought it from the natives. It's in very good condition as it has been stored and kept clean.

It is one of the few things my father kept over the years. Last year he gave it to me to have a jacket made of it. I've not looked around too much yet for a tailor and after seeing your article, and what a horse blanket is worth, I don't think I can afford it! If the price were right I would consider selling it—I am having it appraised now. The poncho would make a good prize for a "Horseman of the Year."

R. W. GLENDENNING, Chestertown, Md.



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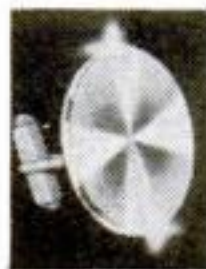
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# The march of science

**How to make the desert bloom—again.** What may turn out one of the most fruitful discoveries of modern science has nothing to do with electronics, atomic energy, or rocketry. It's not even the discovery of something new, but the rediscovery



Ancient rain-catching system, rebuilt, nurtures crops on bone-dry desert farm in Israel.

of old, forgotten knowledge—ancient techniques for farming in the desert. It could convert the arid wastelands of the earth into rich granaries. Vast regions that now support only the scrawny goats of improverished nomads could feed the multiplying populations of undeveloped countries. Poor nations may suddenly find the way to progress open. The economic and political balance of the world might shift, with far-reaching consequences.



**THIS IS THE RESULT:** Harvesting barley (1,100 lb. per acre) on same farm shown in top photo.

You can read these startling implications between the lines of a matter-of-fact report by four Israeli scientists in the journal "Science." A team headed by Michael Evenari, professor of botany at Hebrew University in Jerusalem, spent five years "solving the enigma of the once-flourishing agricultural civilizations in a now barren desert." They seem to have succeeded.

The desert is the Negev, 9,000 desolate square miles forming the southern corner of modern Israel. Today the Negev looks like the backdrop for a second-rate western: gravelly hills dotted

with scraggly shrubs. There is fertile soil in the valleys, but there is no water.

Weather statistics tell the story. Rainfall averages only four inches per year, most of it in quick short showers of less than .4 inch. You can get an idea of how scant this is by comparison



## **The march of science continued**

with the U.S. Phoenix, Ariz., considered very dry, gets 7 inches of rain per year, and rich farm country in Ohio and Indiana averages about 40 inches every year.

Yet the Bible refers to settlements in the Negev. And 90 years of digging by archaeologists has proved that the Biblical passages mean what they say. The Negev was heavily populated during the Judaeen Kingdom (1,000 to 500 B.C.), before that during the Middle Bronze Age (2,000 to 1,800 B.C.), and more recently in roughly Roman times (200 B.C. to 630 A.D.). How could arid desert support so many people?

The clue showed up in aerial photographs. This desiccated land is a crazy quilt seamed with the remains of ditches, canals, dams, and walls. The ancient dwellers of the Negev were masters of hydraulic engineering, unmatched even today. By artful manipulation of water flow, they farmed with only four inches of rain a year. (The ruins eliminate the possibility that the climate was wetter in olden days. Why put all that effort into construction if it isn't necessary?)

Professor Evenari's group deduced that three different irrigation schemes had been used, but the most important and ingenious was runoff farming. Rain water was deliberately encouraged to run down the hillsides, then was captured to irrigate the lowlands. This is contrary to everything taught in agricultural college. Modern farmers fight runoff (as a waster of moisture and despoiler of topsoil) with contour strips, deep-cutting plows, and terraces. Runoff is bad in humid climates; in the Negev, it made intensive cropping possible.

The hills of the Negev are covered with thin, salty soil that wouldn't grow much under the best of conditions. But it also has the happy faculty of forming a tough crust when wet. Rain doesn't sink in. As much as half the moisture runs off along the surface of the crust. So the Negev farmers used the hillsides as gigantic funnels to catch rainwater and pour it onto the fertile, thick soil of the fields in the valleys. They even helped the formation of the hillside crust by raking away stones. The piles of stones are still there.

Since not a drop of water could be wasted, the hills were elaborately netted with shallow ditches and low walls to guide the runoff. The cultivated plots in the valleys were terraced and walled to hold the precious water until it sank in. With so little rain, runoff from a large area was needed to support a farm. It took about 20 acres of desert hillside to irrigate one acre of crop. Land-rich farmers extended their rain-collecting ditches to plateaus high above the fields and even curved them around the hills to pull in water from the far sides.

The Israeli scientists have already put their promising discovery to a very practical test. They rebuilt farms from ruins abandoned for centuries—one near Shivtah (ancient Sbeita), another near Avdat (ancient Abde). At Shivtah (where the farmhouse has a cistern filled by its own runoff conduit), fruit trees and vines now flourish despite two drought years. Avdat (shown in photos) produced a bumper crop of barley in a parching-dry year that saw only 1½ inches of rainfall.



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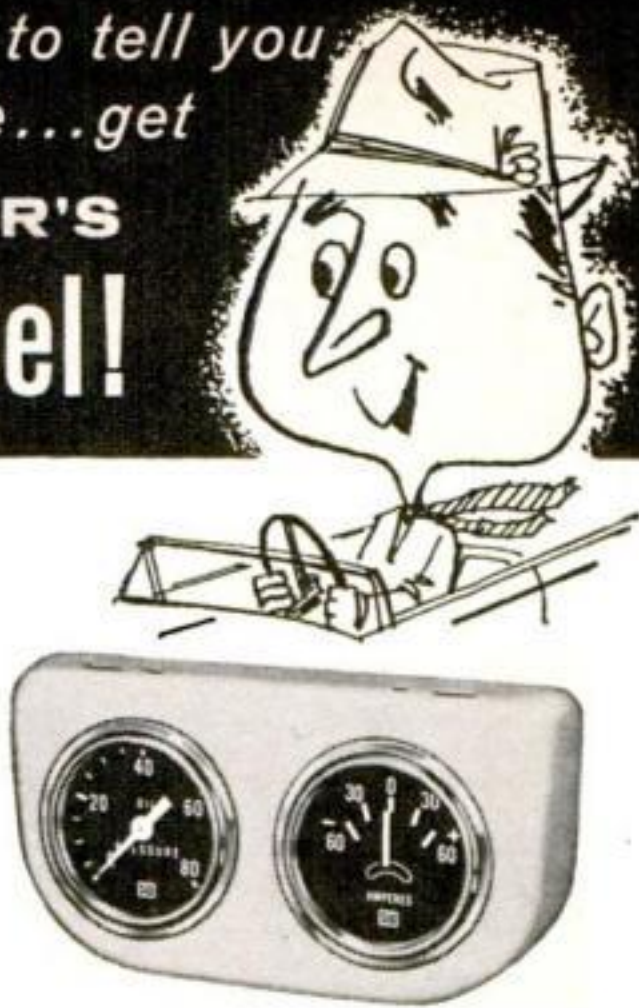
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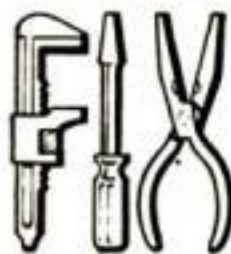
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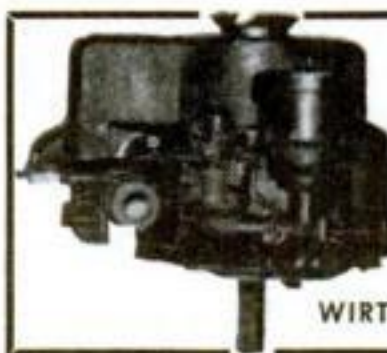
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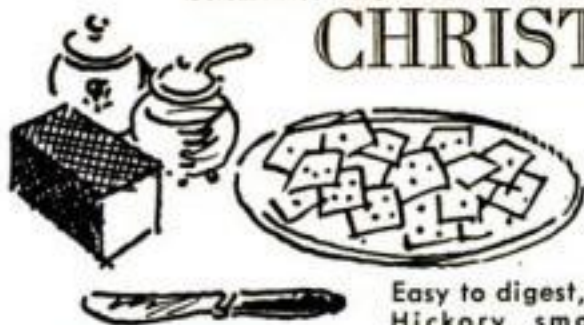
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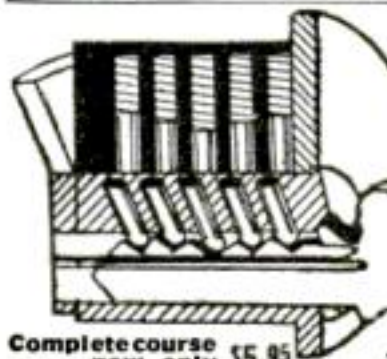
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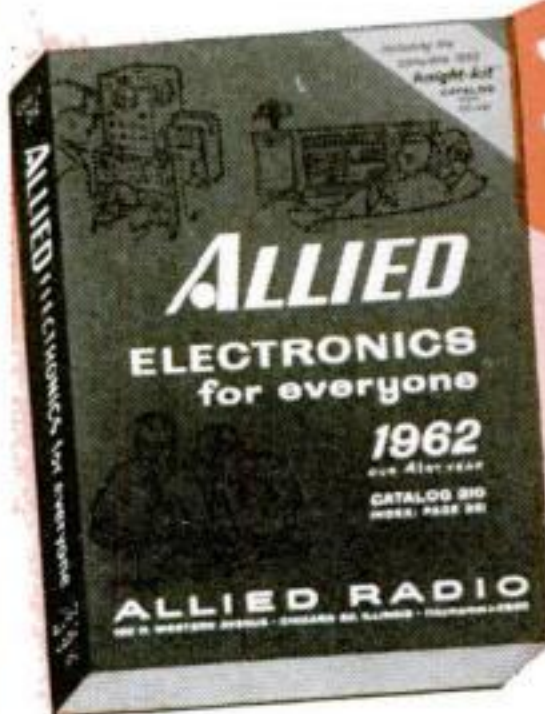
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## DETROIT REPORT

By Devon Francis

### More Power Packages Now Planned

**C**ONVINCED that buyers want more power, several auto makers will offer special horsepower packages in 1963.

In addition to Olds' turbocharged aluminum V-8 engine, Chrysler may offer a super-performance car next year, as well

as a high-powered special for police use.

Oldsmobile's turbocharged engine, due late next month, was hurriedly announced because Olds wanted to be first with the news. Actually, Chevrolet is probably farthest along with its turbocharger.

**Latest word on Cardinal.** The rumor is that Ford Motor Company has thrown out the front-wheel-drive concept for Cardinal and is converting to a rear-engined design. This comes from a

high official of Volkswagen of America. He is quite certain, incidentally, that the Cardinal will eventually be introduced and that General Motors will have to counter with a similar-size car.

**New rag-tops.** More convertibles are on the way. The Corvair convertible, with a manually raised top, will be

ready next March. Ford is about ready with a Comet convertible but some officials are reluctant to okay it.

**Burning question.** Look for at least one low-cost device for combating crankcase and tailpipe smog to be submitted for test in California—and to the entire auto industry—in the next few months. American Machine & Foundry, licensed by the Chromalloy Corp., is completing a system that burns up carbon monoxide

and hydrocarbons in the exhaust circuit.

The key to it is an ingenious after-burner capable of taking the high temperatures involved. A spark plug starts the combustion, which then is self-sustaining. It is said to be good for 50,000 miles—superior to the catalytic systems, which have a shorter life.

**Silent stoppers.** Cadillac, whose engineers say one of the most important products they sell is quietness, will announce next year practically noiseless brakes—something never before achieved

by any car maker, either here or abroad.

These antisqueal brakes are expected to be particularly useful for eliminating those annoying low-pitched noises common in the rear wheels.

**New spring fashions.** When Chevrolet announced its single-leaf spring for the Chevy II, Ed Cole, Chevrolet general manager, predicted that other makers would soon follow.

Oldsmobile and Buick are now tooling up for new 1963 frames that will employ the Hotchkiss drive. This means that the rear coil springs will be dropped, and

it's a good bet that the substitute will be single-leaf springs. Fruehauf Trailer Co. is developing such a spring for trailers.

However, Ford Division, a pioneer in single-leaf-spring development, has just about killed this program. The reason—at least the one fed out to the press—is that prototype springs became permanently deformed by severe loading.

**Suspension program suspended.** Inside sources report that Ford has stopped work on air-oil suspensions. But interest in this suspension continues among both American and European

engineers. Almost every European auto maker has prototypes on test. In this country, American Motors is most active; a Rambler is now scooting 'round Detroit with an air-oil setup.



# Why '62 Rambler stops when others can't



Ordinary car crashes barrier. '62 Rambler stops safely. A hydraulic line on each car was cut by test engineers. Both started together, braked together. Rambler stopped, the other crashed through the barrier.

## NEW RAMBLER DOUBLE-SAFETY BRAKE SYSTEM STANDARD ON ALL MODELS

See '62's freshest styling. Look into scores of "under-the-skin" Rambler advances.

Biggest advance since hydraulic brakes is new Double-Safety Brake System. Tandem master cylinders, one for front brakes, one for rear. If one system is damaged, other still works.

New Road Command Suspension on Classic and Ambassador allows remarkable new precision control. New single lower control arm, outer ball joints. Widest track of any compact.

Tires and wheels precision balanced at factory. Up to 27% more road clearance.

33,000-mile chassis lubrication on most models. Oil filters standard on all models.

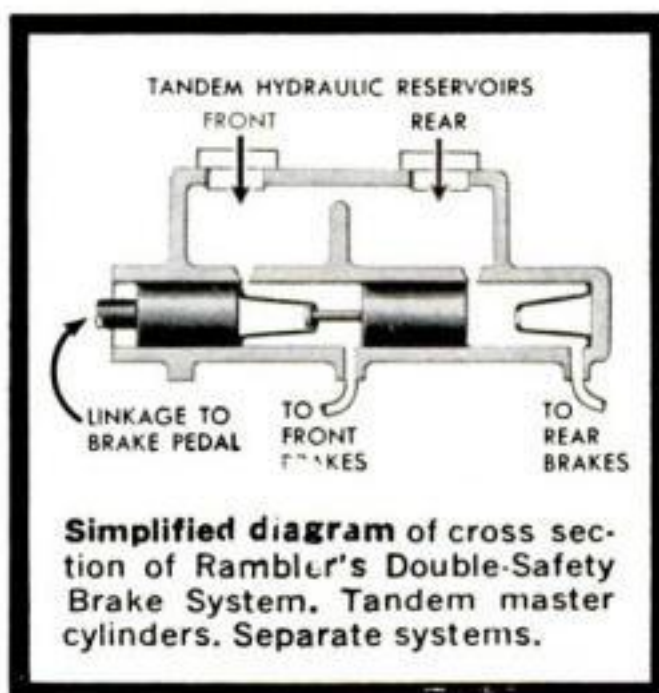
Normal oil change every 4,000 miles. Many parts lubricated for life.

Now, besides Deep-Dip rustproofing up to roof, rocker panels are armor-plated with rustproof zinc.

Ambassador V-8 has best power-to-weight ratio of any compact. 250 or 270 HP.

New E-Stick No-Clutch-Pedal Transmission optional on American—about  $\frac{1}{3}$  the cost of full automatic—with stick-shift economy.

Take a Discovery Drive at your Rambler dealer's. See how Rambler gives you more car for your money.



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# This Car Goes Anywhere

By Hubert Lockett

PS PHOTOS BY R. D. BORST

***Neither snow, nor swamps, nor hills, nor rivers can keep you from your appointment with the wilderness in this backwoods buggy***

**P**OWERED by twin chain-saw engines, this fiber-glass cross-country kart covers water, swamp, or rocky hillside with the reckless ease of a well-trained retriever going after a downed mallard. It'll scramble up a 45-degree slope that would leave a mountain goat breathless, or do

CONTINUED



## This six-wheel, gasoline-burning steed takes you



**BIGGEST SURPRISE** was the Jiger's relatively soft ride. I had expected something more like the teeth-chattering ride of its distant cousin, the racing kart. Learning to drive it is easier than it looks. I took over in an open field where my mistakes wouldn't hurt. At first, things happened more suddenly than I wanted. But I soon gained confidence and was roaring across the countryside.



30 miles an hour across a meadow. On water, it will purr along at six to eight.

Plans call for the Jiger to be in production within the next four or five months. John Gower, the designer and president of JGR Gunsport, Ltd., the concern that will manufacture it, says they already have enough orders to take the first year's production. The price is \$895 f.o.b. the plant in Toronto, Canada.

I drove one of the handmade, pre-production Jigers. Although it was designed primarily to meet the needs of hunters and fishermen, I can report that

.....  
*For details on a soft-tire car you can make yourself, see page 138.*  
.....

it is likely to deal those sports a low blow. Racing cross-country in a Jiger is so much fun you are likely to forget all about your gun or rod.

Every change in terrain, any stream, gully, or hillock that catches your eye is a challenge. You quickly learn that it will take most obstacles in stride and you cast around for sterner trials.

**A 45-degree embankment?** The footing is loose gravel and dirt, strewn with dead tree limbs and large rocks. You pause at the bottom and wonder if you're not carrying your foolish quest a little too far. Screwing up your courage, you twist the handle-grip throttle. The idle snuffling of the chain-saw engines becomes a nervous chatter. You lurch forward as the automatic clutches engage.



**JIGER'S JOURNEY STARTS** where the highways end. It's easier to trailer than most boats, or you can carry it atop a station wagon. Two men can easily handle its 200 pounds. It will carry 450-pound payload uphill or across a lake. If you



**about any place a four-legged oat-burner could**



manage to get it stuck or want to take it with you to places you don't care to ride, you can drive it from outside with only one hand on the control stick. You have double security on water. If you knock a hole in the hull, the tires

provide enough flotation to keep you from sinking. If all tires should go flat, displacement of the hull is enough to keep you afloat. On level ground, you can streak across country at a top speed of 30 m.p.h.



More throttle. A toe-tingling vibration shivers the fiber-glass hull as the engines rev up. A cloud of blue-white smoke momentarily stings your eyes. You're in low range, so those little engines are turning over 44 times for every one revolution of the driving wheels. It feels terribly busy down in the engine room under your seat.

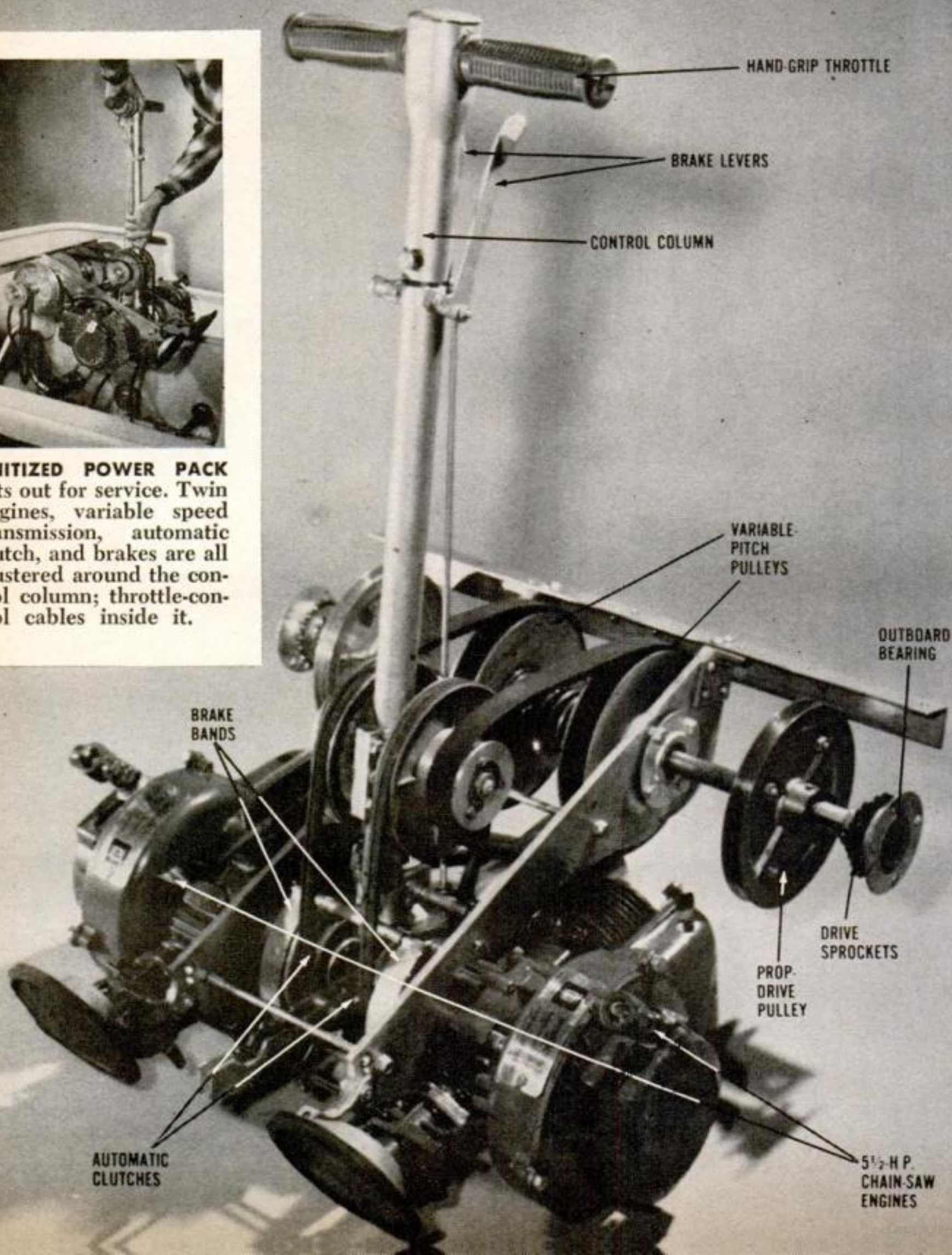
The front deck (hood?) rears up at an alarming angle. Glancing quickly over

your shoulder, you decide you are about to topple backwards. A peek over the side reassures you, though, when you see all six wheels are still on the ground. A small avalanche is started behind you as the wheels spew out a torrent of loose stones and dirt. For a moment it seems you have asked too much of even the Jiger.

The middle and rear wheels are now clawing for solid footing, the front wheels



**UNITIZED POWER PACK** lifts out for service. Twin engines, variable speed transmission, automatic clutch, and brakes are all clustered around the control column; throttle-control cables inside it.



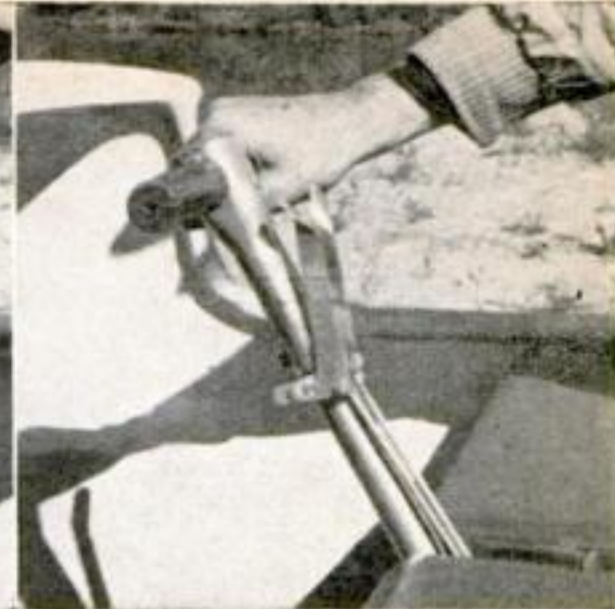




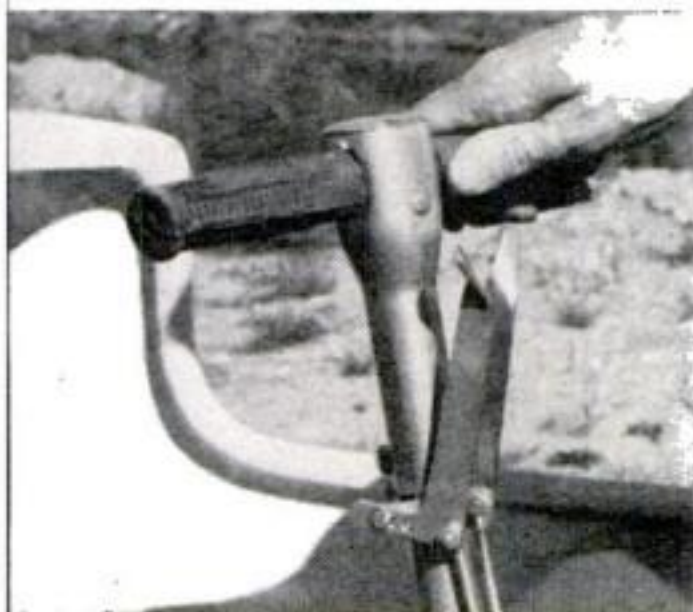
**STARTING.** It's easier this way, but you can start the engines while sitting in the seat.



**REVVING UP.** Twisting hand grips so the wrist moves down speeds up both engines at once.



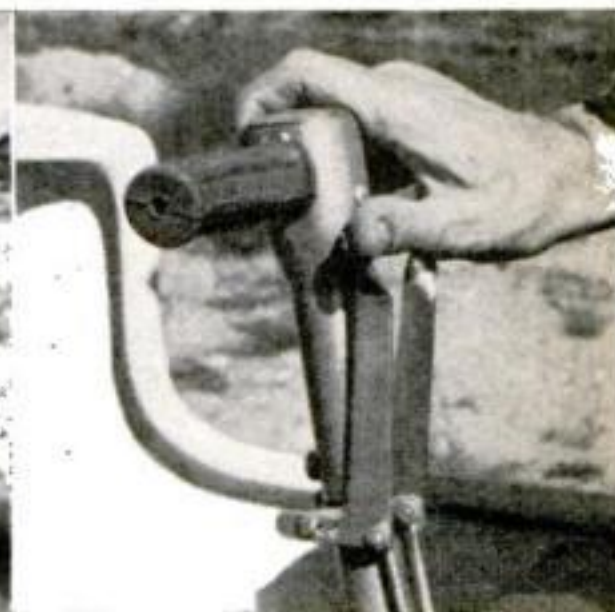
**SHIFT INTO HIGH.** Shoving the control column full forward puts transmission in "cruise."



**RIGHT TURN.** Rotating column speeds port engine, slows starboard for gentle course change.



**RIGHT-ABOUT FACE.** Applying the starboard brake with thumb brings car around smartly.



**HALT.** Releasing throttle and light pressure on both brake levers produces an abrupt stop.

vainly pawing the surface. You lean far forward to get some weight on the front wheels and she slowly pulls herself out of the hole.

When you reach the top, you look back uncertainly, still not prepared to believe

you came up that slope in a wheeled vehicle.

The wildly mixed ancestry of this bizarre little car gives it a personality like nothing else you've seen. It borrows a

[\[Continued on page 188\]](#)



**TWIN PROPS** toe in so that steering can be done controlling each engine independently. Guards are razor sharp to mow entangling weeds. Plans are to install jets on later models.



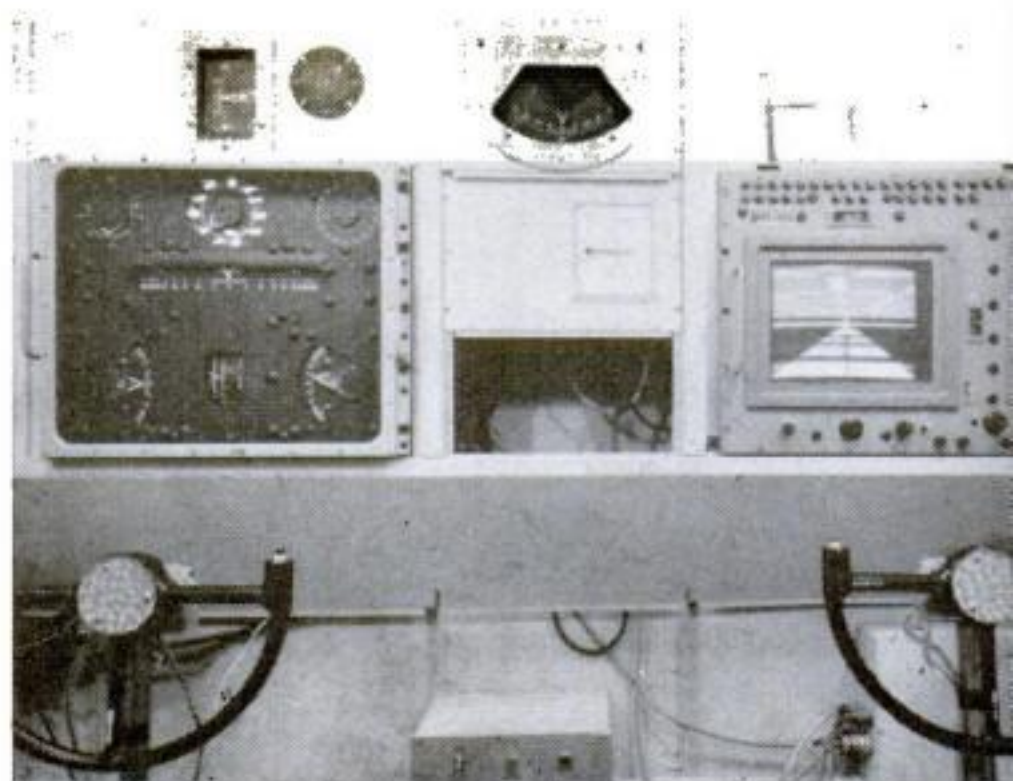
**MOLDED-FIBER-GLASS CANOPY** will be sold as an extra-cost option. Clear-plastic curtains will make a weathertight cab. In one version, cab will tip back and become a trailer.



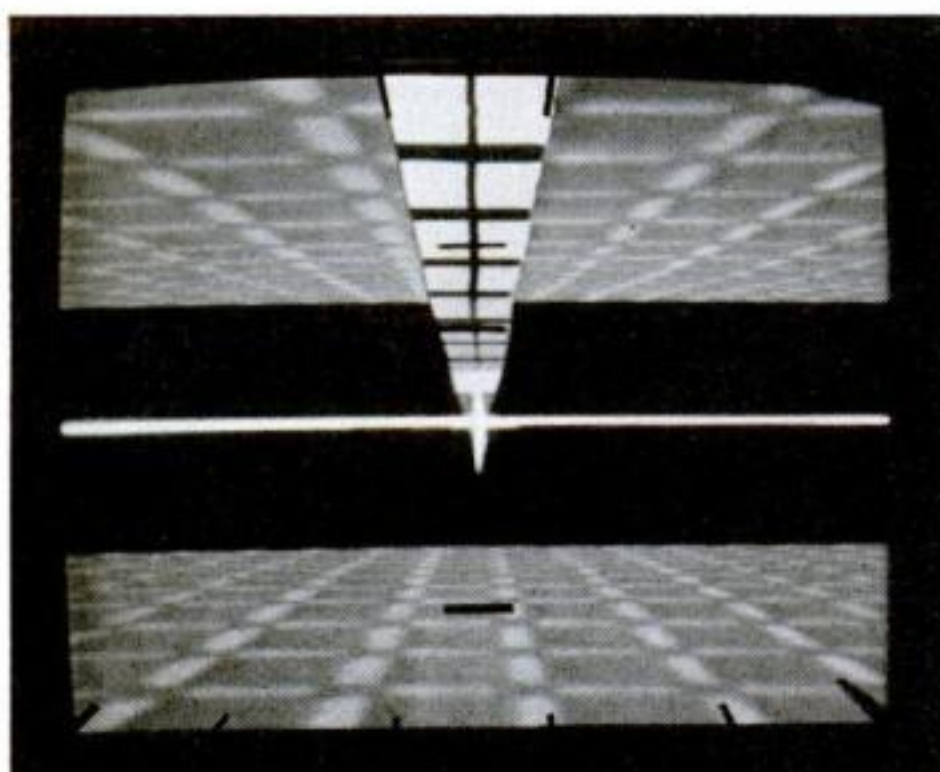
## Electronic "windshield" guides sub helmsmen

Submarine pilots may soon steer their craft by looking at a TV-like screen instead of dials and pointers. The device, called Conalog for contact analog, has passed tests on the nuclear sub Shark.

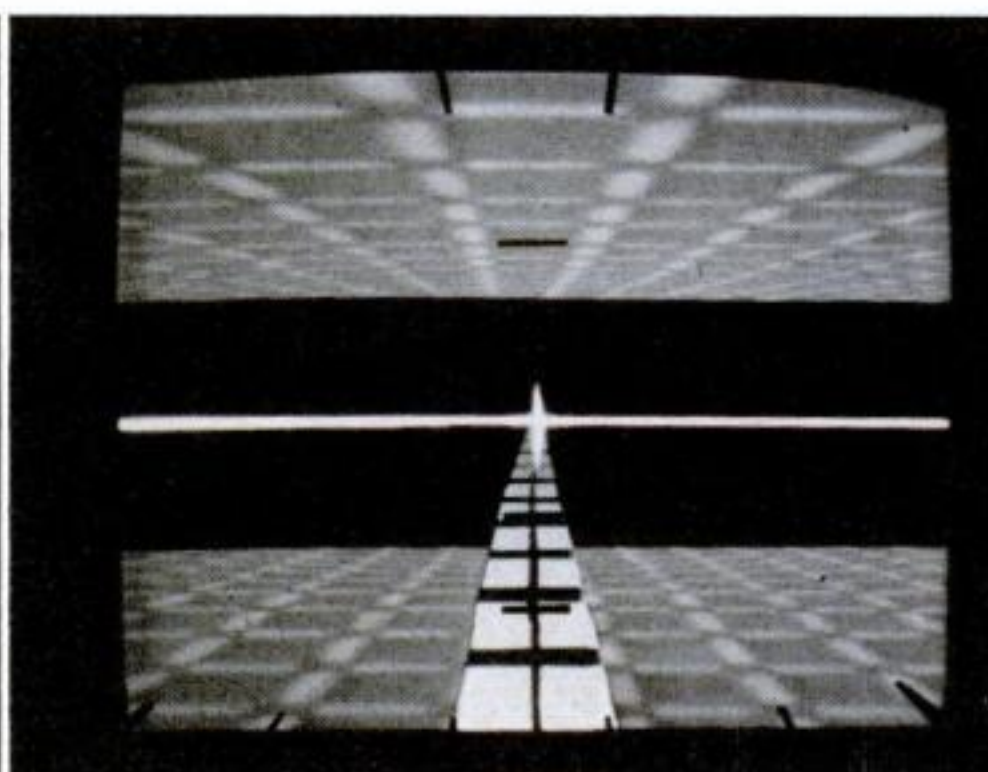
The electronic "windshield" does not actually report what is ahead of the sub. Instead, it supplies a visual representation of the figures on course, speed, and depth ordered by the skipper. These figures are transformed by a display generator into a picture of an undersea highway that the helmsman then tries to follow as closely as possible. The screen also shows the pilot where he is in relation to the ordered course.



**CONALOG STEERING SYSTEM** is mounted at right, the present dial-and-pointer mechanism at left.



**NOW IT'S ON COURSE** and no longer climbing, but narrow "road" at top shows it's below depth.



**STILL ON COURSE** and at zero angle, but narrow "road" at bottom shows it's above depth.

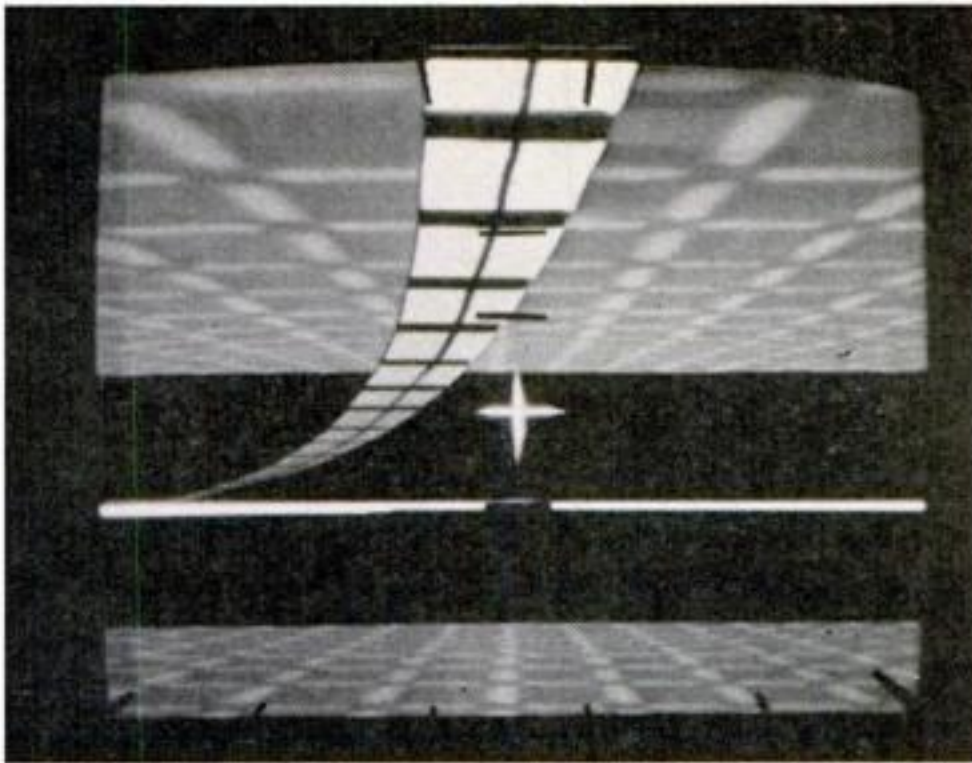


## Roof-top swimming pool

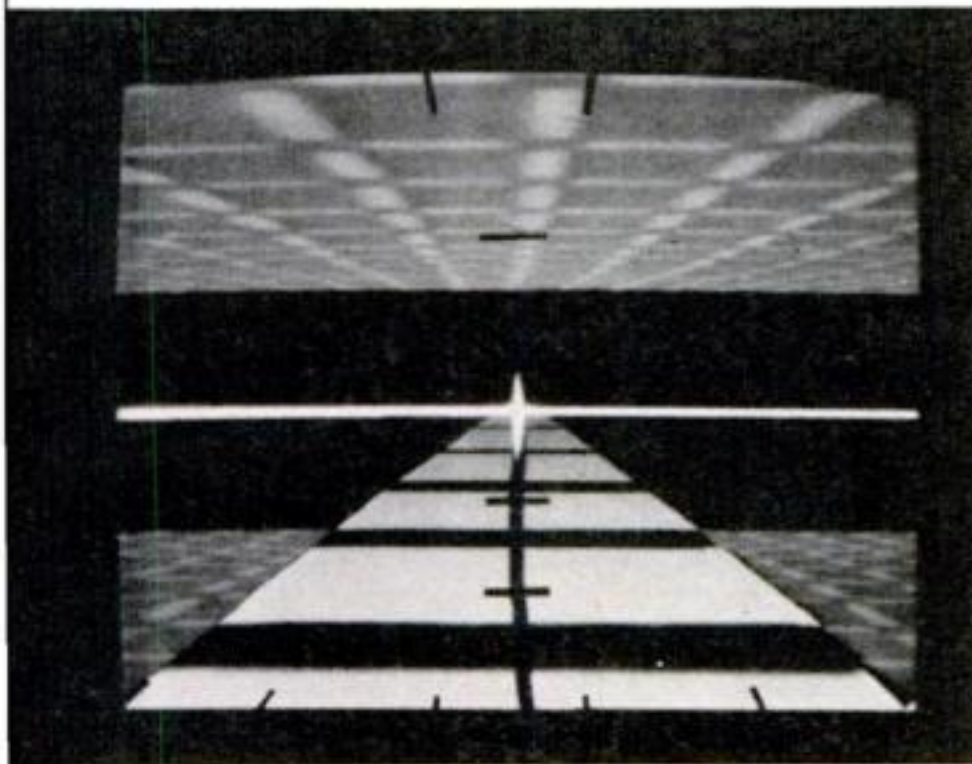
An aluminum swimming pool atop a five-story extension of the Hotel Robert Meyer in Jacksonville, Fla., saved half the weight of a steel one and required only a base to set it on.

The pool was semi-fabricated from Reynolds aluminum in the Hamilton, Ohio, plant of Chester Products, Inc., installed in less than three weeks.





**SCREEN SHOWS** sub is off the ordered course and below ordered depth but climbing.



**ALL OKAY.** Wide straight "road" shows sub on ordered course, level at ordered depth.



### Low-level speed record

Flying over the flats at White Sands, N. M., at 50 feet above its ground shadow, a Navy McDonnell F4H Phantom II is shown here setting a mark of 902.769 m.p.h.—a record for low-level flight.

The fighter, piloted by Lt. Huntington Hardisty of Jacksonville, N. C., with Lt. Earl H. De Esch of Allentown, Pa., as radar officer, flew the course twice in each direction at under 328 feet. Both men were decorated for the feat.



### Paving an irrigation ditch

Since nearly half the water stored in reservoirs in the dry West is lost by seepage enroute to crops and faucets, the U. S. Bureau of Reclamation has begun a paving project to seal the water in.

Main canals are drained and paved with reinforced concrete, but this is expensive. Money is saved on small ditches, such as the one above in Wyoming, by dumping in an asphalt solution. It turns the water milky, but is harmless and soon settles to provide a rubbery lining.



# Who Pays If You Crash?

***It could be you, say the courts, even though you think you're guiltless. Here are some facts you should know***

**By E. D. Fales Jr.**

**S**UPPOSE you're driving to work, see a stalled car, and give a helpful push. Suddenly: sounds of shattering glass and tearing metal. Your car jolts and locks bumpers with the fellow you're pushing. You're shocked to see he has run squarely into, and damaged, somebody else's brand-new Cadillac.

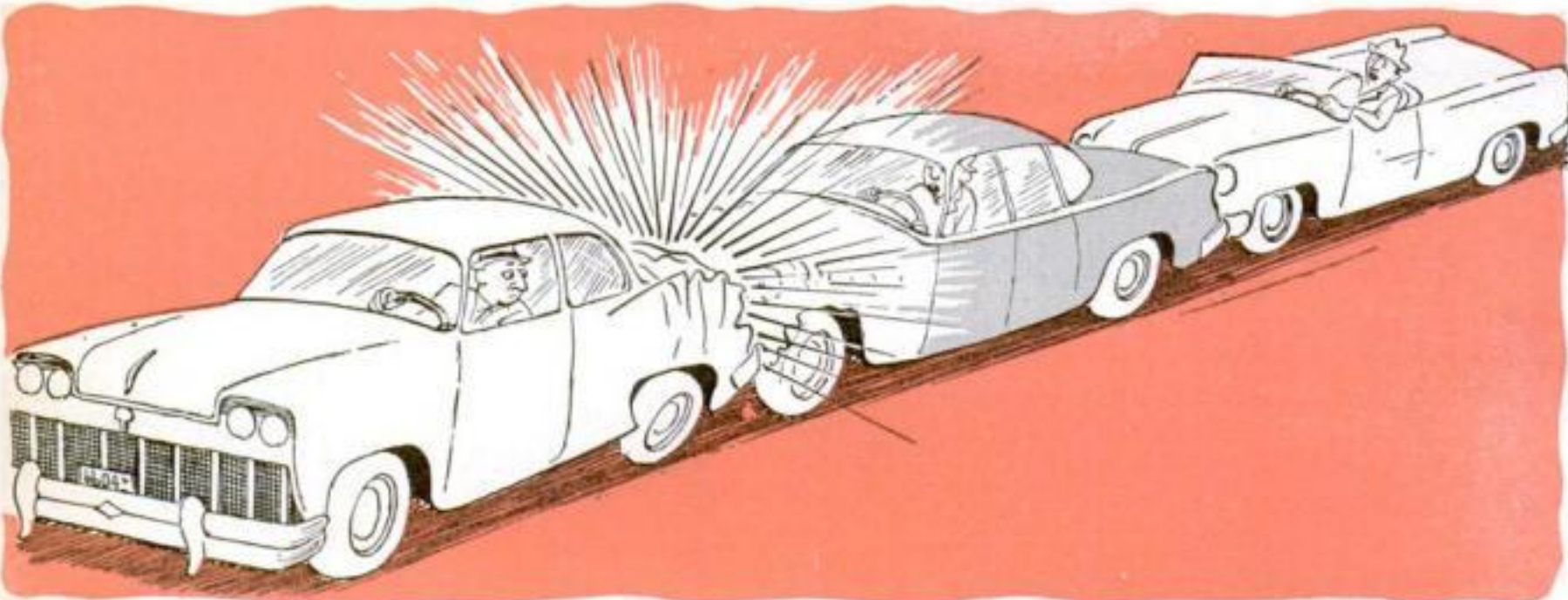
Who gets sued in a case like this? What will the judge say?

If you're like most drivers, says lawyer Charles Collins of Washington, D.C., you don't know how the courts have ruled in many special driving crises. Collins does. As general counsel for the American Automobile Association he studies masses of decisions on drivers and driving.

Here are some findings you should know about. They come from Collins' files and from those of the National Association of Claimants Counsel of America, of Boston.

---

## ***The case of the stalled car and the helpful pusher***



Every driver now and then is asked for a push. To guard yourself, says Collins, you should heed what happened to Mr. B.

In Virginia one rainy winter night, A's car stalled and helpful Mr. B pushed. Driver A hit a third car, and a jury later pinned a \$5,000 damage bill on poor Mr. B, the pusher.

B felt it was unfair and took his case to an appeals court. The court came to his rescue—and laid down some rules to guide pushers:

A driver who gets paid to push may be liable because he has a working re-

lationship and may even tell Mr. A what to do. But Mr. B was just pushing out of the goodness of his heart.

However, even a good Samaritan pusher, the court said, must realize he's tackling a dangerous job and must (1) foresee all hazards that can arise; (2) signal just like any operator, regardless of the fact he is pushing; and (3) use all "due care."

But a negligent pusher—who goes too fast, pushes past blind corners or across opposing traffic, and assumes everybody else will look out—may well have to foot the bill.



## The troublesome wasp



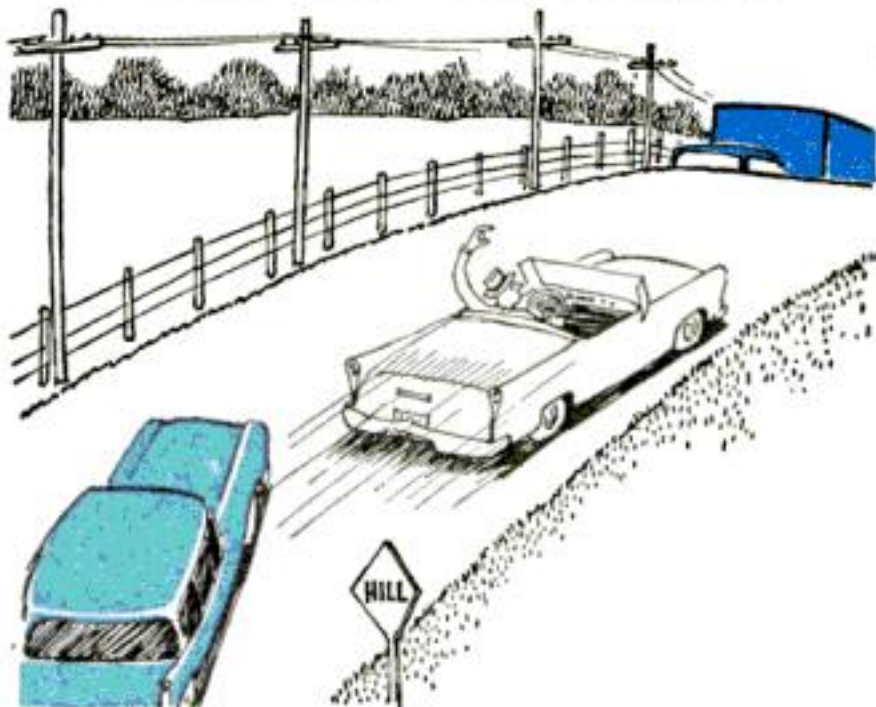
In Louisiana a wasp flew in Driver R's window. R became panicky, swung at the wasp—and ran into a car.

The other driver charged him with negligence and a jury agreed. He'd have to pay for damages to the other car.

But higher courts often ponder the ways of drivers more deeply than juries. An appeals court said no; R wasn't negligent. He had merely shown himself human; and a driver who does the human thing is quite apt to be a prudent driver, even if his impulsive action gets him into trouble.

This decision could save you. But Collins also offers this tip: Best bet when you have a wasp aboard is to pull off quickly and stop, and then swat. Not all judges may turn out to be as broad-minded as Mr. R's.

## The fellow who wants to pass



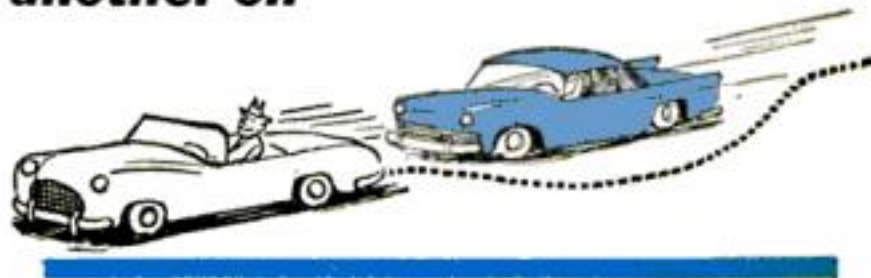
You're climbing a long hill. A faster car comes up behind you. To be helpful, you wave him on as truck drivers often do. As he passes, a car comes over the hill and hits him. Can you be sued?

Yes, and possibly by both drivers.

"Never," says Collins, "invite another driver into possible trouble, even with the

best intent." You could courteously pull far over. Then, if he decides it's safe to pass, that's his responsibility, not yours.

## When one driver "eggs" another on



Brown and Green are on a trip in the same car. Driver Brown tries to overtake another driver, Mr. H, and succeeds. But H doesn't like it so he overtakes Brown, then slows and blocks the road. (This has happened to you?)

Brown tries to pass again. H weaves slowly back and forth, holding the road. Brown, being human, grows angry. Both cars now race. And H, still determined not to be passed, runs through a stop sign and turns right. Not to be outdone, Brown also runs the sign, tries to circle around H—and runs into a ditch.

In the crash, passenger Green is killed.

In such a case recently, Green's family sued H. H replied: "Why, he was killed because Brown ran into a ditch. It wasn't my fault."

Said the court: Yes, it was. A driver is, in a legal sense, his brother's keeper. If he deliberately eggs another into a dangerous act, he may be liable for the consequences. He can lose whatever legal protection he might have had from the other driver's negligence.

## Losing your rights to collect

Driver Jones races recklessly out of a side street. Driver Smith doesn't see him coming and gets hit. He sues Jones.

Suppose you're Smith. It was all Jones's fault, you say. If he'd been driving properly there would have been no wreck. Can you collect?

It may astonish you to learn that in countless cases the courts have said no. The reason: You didn't keep what courts call "proper lookout." You didn't expect a car and so you didn't look both ways. Jones thus can claim that, no matter

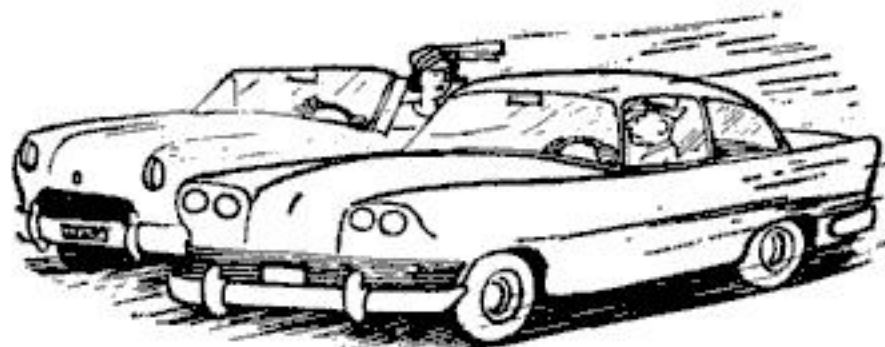


## **You have a legal duty to help another driver avoid**

what he did, you were guilty of "contributory negligence." And in most states this means you can't make him pay for damages.

Contributory negligence can even be a dirty windshield, poor lights, a noisy radio that drowns out horns, speeding, backing improperly.

### **The woman who speeded up**



How often have you tried to overtake a car only to have it speed up?

Driver J tried to overtake Miss P, but she put on speed. Just then a car came the other way, and J found himself trapped in the passing lane.

To avoid a header, he swerved right and sideswiped Miss P, who landed in a ditch. When she got out, J had a lawsuit on his hands.

But the jury sided with J. It blamed Miss P for showing "indifference to consequences."

You must never think: "Oh, well, if he passes me he may have an accident but that's not my fault." You have a legal duty to help another driver avoid trouble—even if you disapprove of what he is doing.

### **The quick-stop crash**

It happens hundreds of times a day: Car No. 1 stops—say for a left turn—and gets hit in the rear by Car No. 2. Who has to pay?

Usually juries have pinned the bill on the second driver, who didn't stop in time.

However, says lawyer Collins, there's a new trend. Some courts have also been pinning on the driver ahead heavy new responsibility to "pilot a safe course" for those behind him. In Connecticut recently a driver who had been hit from behind was arrested, even though he'd stopped for a pedestrian he thought wanted to cross a road. In Massachusetts a driver who stopped without warning

for a turn was made to pay bills for four people hurt in the car that hit him from behind.

### **The case of the sneaky third car**

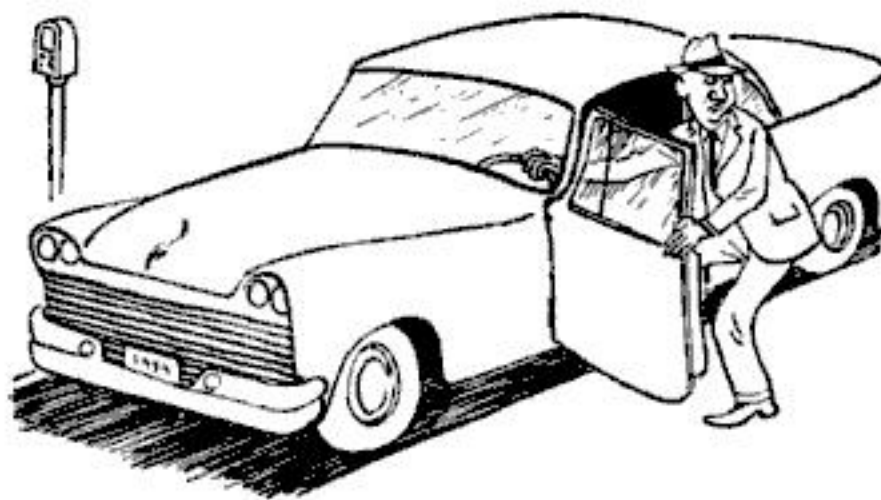
D shoots unexpectedly out of a driveway, scares you into a collision with another car, and then scoots off. If you get his license-plate number, can you make him pay?

For years lawyers got juries to believe that a car that didn't get into a crash couldn't possibly have caused it.

But lately courts have seen the fallacy of this reasoning. In Pennsylvania recently justice caught up with an overhasty Mr. D who caused a crash without getting into it. He was sued and had to pony up for damages to both other cars.

Other kinds of drivers who cause accidents but don't get into them include those who: have one headlight out; rush up to stop signs as if planning to run through; pull off a parkway for repairs and leave two wheels on the pavement; double-park; stop or back up on busy roads. And lawyers are waiting for a test case involving the willful slowpoke who causes accidents but ironically rates as a safe driver because he never gets hit.

### **If you leave the key in your car while you go into a store**



A thief sees the key, steals the car, and runs over Mr. Y.

Mr. Y sues you. Can he collect?

Like Collins, who studies such matters for AAA, Thomas Lambert Jr. studies decisions for the National Association of Claimants Counsel of America. Here's what Lambert says:

If the accident occurs right after the theft—during the getaway period—courts often hold that you "created a risk" and



## **trouble—even if you disapprove of what he is doing**

are liable for any damages that may result.

But if the thief still has your car some days later, an "expiration of risk" has occurred. If he then has an accident, a judge might rule that you were "sinned against." You are no longer the sinner, hence are no longer to blame for what the thief does with your car.

### **The sleepy driver**



A driver trying to make time on a cross-country trip falls asleep at the wheel. His car hits yours.

You sue. His lawyer says: "But my client was asleep. You can't blame a man for what happens when he's sleeping."

Ridiculous? You may think so, but courts in the past have agreed with this line of reasoning.

Now they are beginning to take a more realistic view. Sleep never comes without warning, and so the driver who falls asleep is being found liable. By failing to stop and rest he invites sleep and thus becomes negligent.

### **Should your passenger "speak up"? What do courts say about back-seat drivers?**

This is important to know, since it may affect the chances anyone riding with you (wife, friend, relative) has of collecting damages if hurt.

If an unusual danger arises, the passenger has a legal duty to warn you. Failing to do so, the passenger may be ruled negligent and may not be able to collect from another driver who causes a crash.

An exception: If the passenger knows you see the danger, he has no duty to speak up. In fact, at least one judge has ruled that in such a situation it is better for the passenger to remain silent and let you figure out what to do.

In general, here's what courts have said: The passenger (1) may assume the driver is reasonably careful and able to cope with normal problems; (2) should remember that unnecessary advice can be hazardous; (3) must give warning of unusual danger (such as, perhaps, a fire engine or speeding car unseen by the driver); and (4) must protest even to the point of demanding to be let out if the driver becomes reckless.

People hurt while riding with wild drivers have sometimes lost all right to collect damages because they failed to protest.

### **Someone hits your car while you leave it in a parking lot**



You return to find a door bashed in.

"You owe me a new door," you say to the lot manager. He shrugs: "We didn't do it. Some customer did it." You say: "No matter, it's your lot." He points to your claim check and says, "Did you read this? It says: *Not responsible for damages.*"

Who loses?

That depends. Courts tend to draw a line between two kinds of lots. If you park your own car, lock it, and take the key, you may be paying only for rental space and the lot has no duty to protect you.

But if you give the keys to the car jockey, or leave them so he can move the car, then you "clothe him with possession" of the car and are paying for care. In event of damage, courts have held, the lot must make good.

[Continued on page 197]





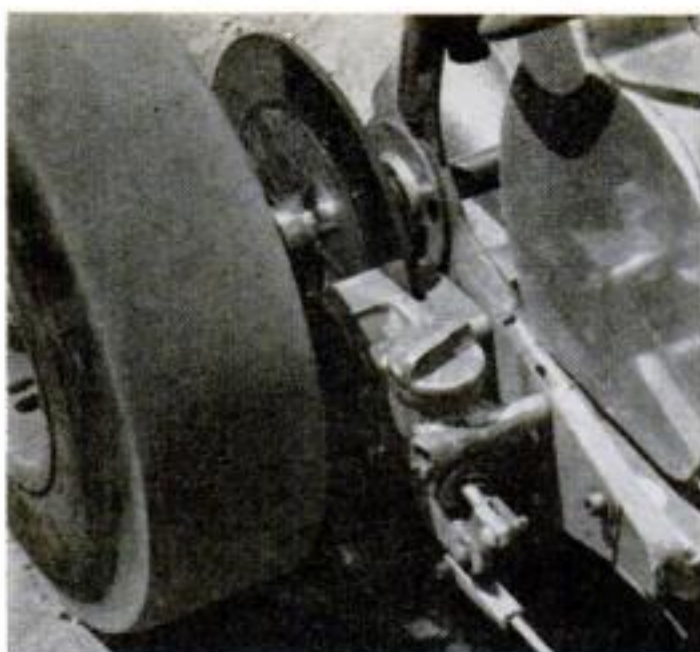
**RACK-AND-PINION STEERING** insures good handling. Drag-racing rules require a roll bar. Owners Packwood and Sanders (left to right) are planning a kart with twin 500 Es. Estimated quarter-mile speed: 150 m.p.h.

## Kart can go 130 m.p.h.

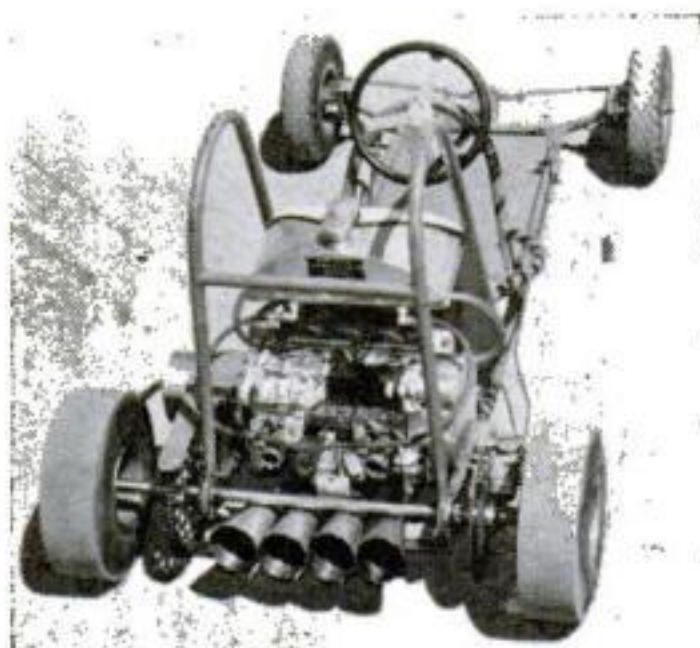
Combine a 44-cu.-in. outboard motor with a tiny chassis made of one-inch chrome-moly tubing. The result—as builders Bill Packwood and Glenn Sanders of Pico River, Calif., learned—is a superkart capable of 100.55 m.p.h. in 12.58 seconds in the standing-start quarter mile. Top speed, they estimate, may be 130 m.p.h., if they ever decide to really open it up.

The healthy 500 E Mercury four-banger belts out 55 hp. at 8,000 r.p.m., its governed speed. Mercury engineers say it can rev to 14,000 safely. Speed accessories include twin carburetors on special intakes, tuned headers, and a magneto.

Wheelbase is 64 inches and the tread 31 inches. Total weight is 225 pounds, giving a fantastic weight-to-horsepower ratio of about 4:1.



**SPOT BRAKE** similar to those used on full-size dragsters and sports cars is mounted on right rear wheel only. Miniature “slicks” at rear look much like midget-racing-car tires.



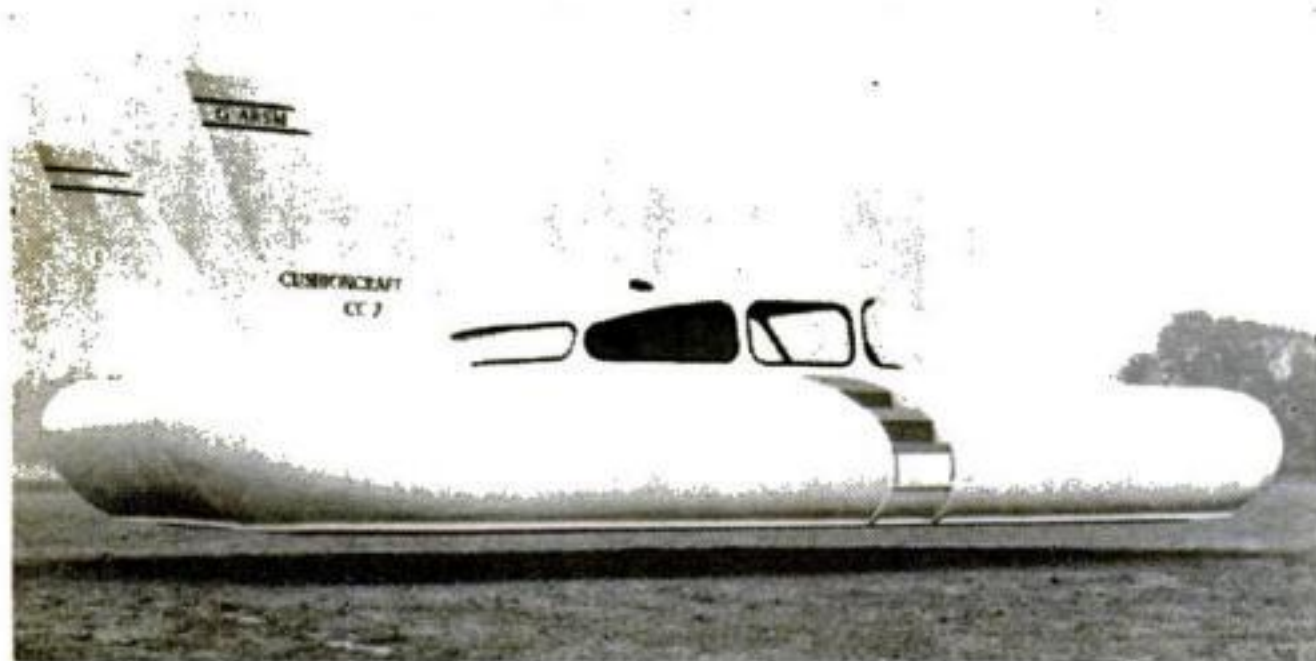
**SINGLE PARTITIONED TANK** holds water for engine cooling in its front half and gas in the rear section. Chromed cylinder ahead of left wheel is a centrifugal clutch, made to take the engine's great torque.

## Family-size air car uses auto engine

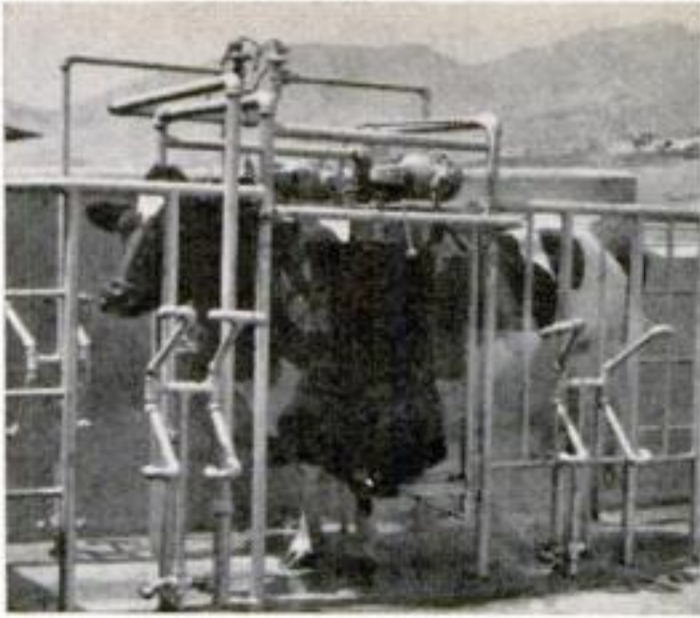
A 10-seat Cushioncraft now under test in England uses a Rolls-Royce 380-cu.-in. V-8 car engine that drives twin fans.

These lift the 2½-ton fully loaded machine a foot above ground or water, or two feet with a light load. It's propelled and steered by thrust from air jets on its underside. The eight-by-nine-foot cabin is pressurized to eliminate dust, fumes, and spray.

The vehicle, developed by Britten-Norman Ltd. from a smaller experimental model (PS, Oct. '60), has a top speed of 55 m.p.h. The goal is an air car powered by a production engine.







### Cow-washing machine

An automatic cow wash, operating like a car wash, puts cows through the rinsing line at the rate of 800 an hour.

The contraption consists of multiple pipes and nozzles. It was invented by Teo Albers of Artesia, Calif., to make it easy to comply with a California law that requires cows in commercial dairies to be washed twice a day, before each milking.



### Automatic coal scuttle

Apartment dwellers in Britain may buy coal this winter from coin-vending machines. Pop half-a-crown (35 cents) into the slot, pull a lever, and out comes a 21-pound bag of washed coal. The device also makes change.

The first machines are being installed in Edinburgh, with more to follow in other large cities.



### Plasma engine for satellite

This fuel-less engine, being readied by Republic Aviation for flight early next year, will enable satellites to change course, fly in formation, or hover over any point on earth.

Solar cells charge a 28-volt storage battery that powers a ring of 3,000-volt capacitors. From 2 to 10 times a second, their discharge acts as a magnetic piston to squirt a tiny jet of hot nitrogen rearward, causing flashes of light and maintaining a small but effective average thrust of 1/100 of a pound.

Engineers call the heated discharges plasma. A small bottle will hold enough nitrogen to run the engine for at least two years.



### An in-between-size Mercury

This "senior compact" by Mercury makes its first appearance in '62 models. Named Meteor, the unitized-construction car is 203.8 inches long overall, nine inches more than the compact Comet. The 170-cu.-in., 101-hp. Comet engine or a new 221-cu.-in., 145-hp. V-8 is available. Chassis needs lubrication only at 30,000-mile intervals.



# Plain Facts About FALLOUT SHELTERS

**By Martin Mann**

**P**EOPLE who built fallout shelters for their families used to keep it secret for fear they'd be considered crazy. Suddenly, they're the most popular guys on the block. Safety precautions against the ravages of atomic war no longer reveal old-maidish nervousness but admirable prudence.

Across the country citizens are hauling concrete blocks into cellars, digging holes in their back yards, and pestering officials for advice. The shelter business is booming like a 25-megaton blast.

But the alarming fact is that many buyers and builders of shelters don't

know what they're doing. They concentrate on unlikely hazards and slight the real ones. Often too much is spent for inadequate protection. Some customers are being suckered by suede-shoe operators who unload worthless gimmicks at fancy prices.

Fallout is a weird and unprecedented danger. No one knows all the answers. But there are things you can do to guard yourself and your family against this invisible menace. In today's uncertain world, you may have to.

Here are the straight facts you need to know, gathered with the help of the U.S. Government's Office of Civil Defense.

---

*What's the point of all this effort?*

*Wouldn't an H-bomb attack kill everybody anyway, shelters or no shelters?*

The Doomsday Machine hasn't been invented yet. The death toll from an H-bomb would be frightful, but well-built shelters could save nearly everybody outside the area of severe destruction. Without shelters, many of these people—perhaps millions—would be killed by fallout.

*What's the difference between a bomb shelter and a fallout shelter?*

Bomb shelters—World War II style—protect you against the explosion blast and falling debris. Fallout shelters shield you against deadly atomic rays. Some shelters—for example, a corrugated steel culvert buried under three feet of earth—do both. Simple basement fallout shelters provide a little blast protection, but not much.

The important fact is this: Fallout is

the big danger because it could kill millions of people who are so far from the blast they wouldn't even hear the bomb go off. Blast protection is a fine extra, but you need fallout protection no matter what. If you're within blast range, you are certain to get heavy radiation. Watch out for fast-buck types who push simple blast shelters without radiation shielding. These shelters are almost worthless.

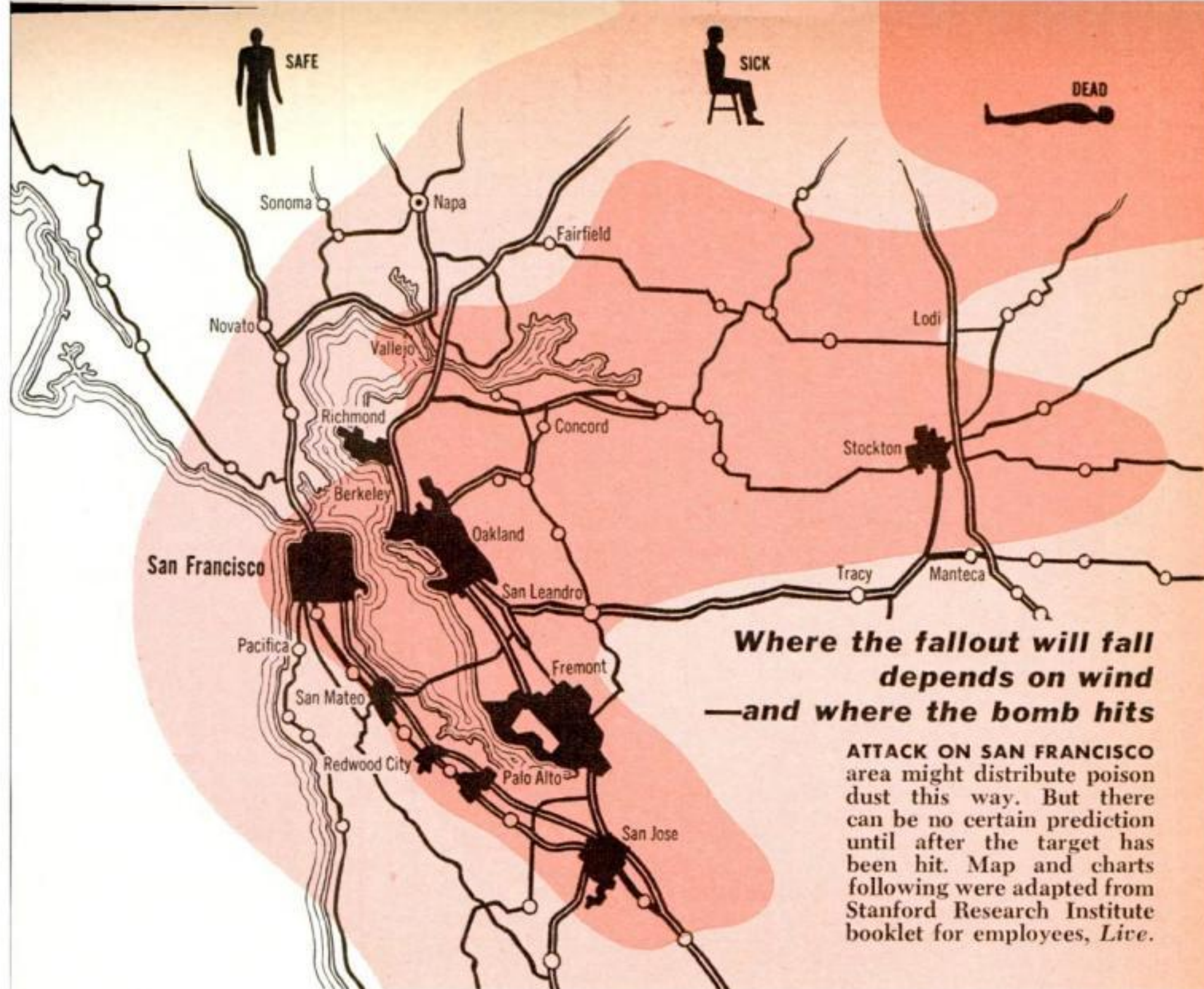
*What is fallout?*

Poisonous dust. A nuclear blast on the ground kicks up a tremendous amount of dirt—earth, water, pulverized buildings and trees, anything. This dust mixes with radioactive ash from the bomb as it is sucked high into the atmosphere. The deadly mixture is blown hundreds, even thousands, of miles by wind.

*Will every bomb cause fallout?*

Only explosions on or near the surface





of the earth create fallout; explosions high in the air do not. (The A-bombing of Hiroshima and Nagasaki caused no fatalities from fallout.)

The fusion process, which gives the hydrogen bomb its fantastic power, leaves no radioactive ash and therefore no fallout. But fusion must be triggered by a fission detonator. That's where the fallout comes from.

#### ***What's so bad about fallout?***

It can kill you. One surface blast of five megatons (equivalent to five million tons of TNT) will produce fallout as radioactively hot as 250 million tons of radium. Even 100 miles away, the radiation dose might run to a thousand roentgens (r) in 18 hours. Anybody who gets that many r's in that short a period will die, rather unpleasantly, in three weeks or less.

Those figures apply to a middling five-

megaton bomb. The Russians claim to have a 100-megaton job in the works.

#### ***How does fallout hurt people?***

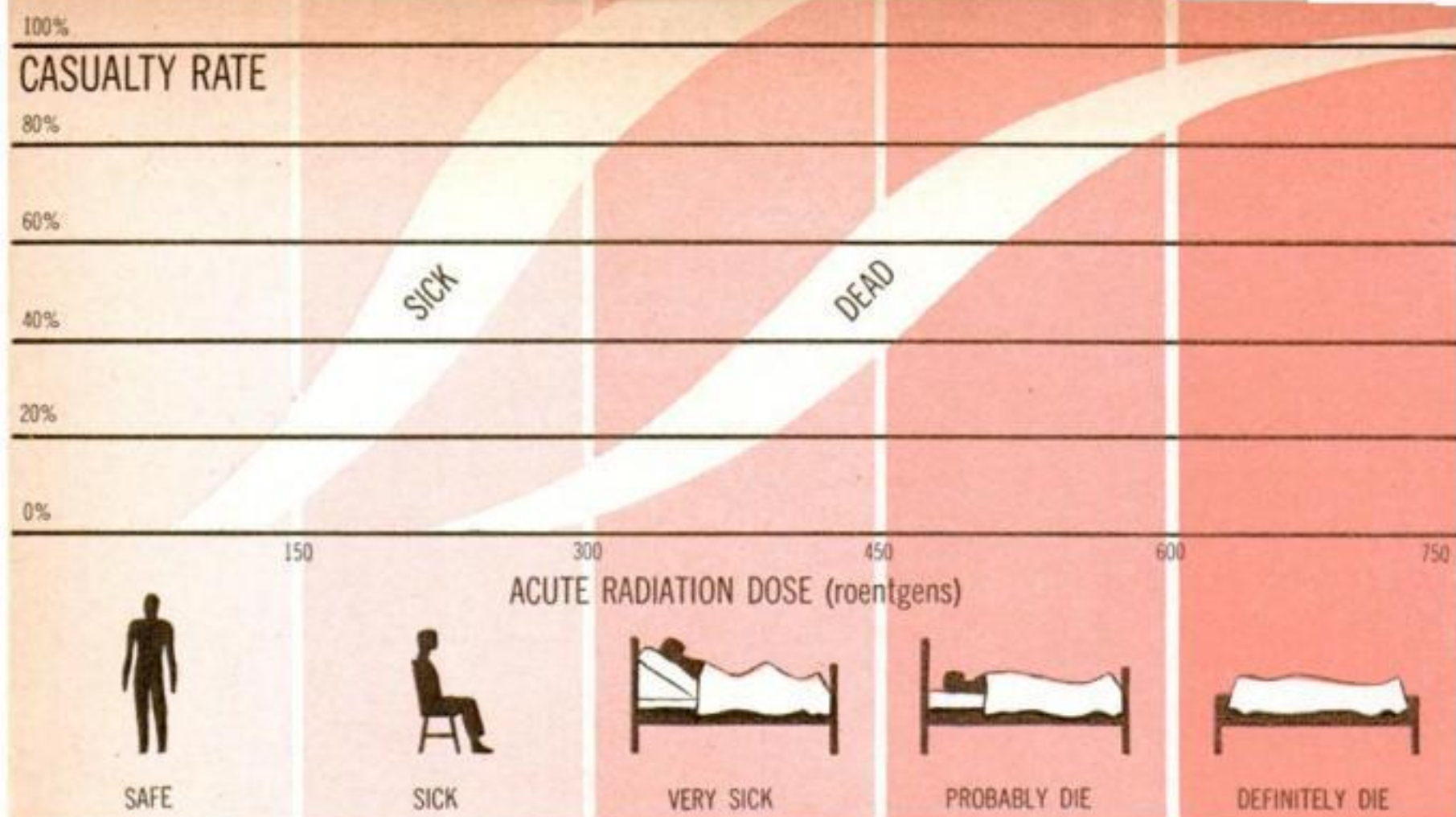
The unstable radioactive atoms break up and release powerful gamma rays, which are like X rays. You can't see, smell, or feel them. Each gamma ray keeps going until it runs into the center of an atom. The rays that pass through your body don't hurt you. The ones that are stopped by atoms in your body destroy those atoms.

#### ***Does everyone that gets hit by gamma rays die?***

You have been struck many times by gamma rays (from cosmic radiation, luminous watch dials). A few cause no apparent trouble. Moderate doses make you sick, but there is no sharp dividing line.

The more concentrated the exposure,





**SOME PEOPLE CAN TAKE MORE RADIATION** than others. On the average, you stand a 50-50

chance of getting sick from a sudden dose of 200 r, of dying from a sudden dose of 450 r.

the more dangerous it is. About half the people who accumulate a 450-r dose within 24 hours will recover, the other half will die. But 450 r spread over a lifetime won't hurt anyone.

***What about the recent tests of H-bombs? Is their fallout killing people?***

Tests in remote corners of the world do generate fallout. But by the time it reaches populated areas it is so diluted and weakened that it causes no immediate, direct harm. How much long-range harm it causes is a bitterly argued question that may not be settled for centuries. The difference between fallout from a bomb test in Siberia and fallout from a bomb attack on Minneapolis is the difference between shortening the lives of a few people and killing millions of people outright.

***Aren't remote sections far from prime targets safe?***

No. Where the fallout falls depends on where the bomb hits and which way high-altitude winds blow. An attack would surely bring widely scattered bombs in

several waves. So you cannot tell in advance which areas, if any, might remain clean. Some attack patterns would blanket every inch of the country with heavy fallout.

***Will the Government provide public shelters where everyone can take cover?***

The present plan is to survey existing buildings, find usable spaces, and outfit them with food, water, ventilators, and standby generators. Some congressmen are urging the building of large shelters from scratch.

***Is a public shelter better than a private home shelter?***

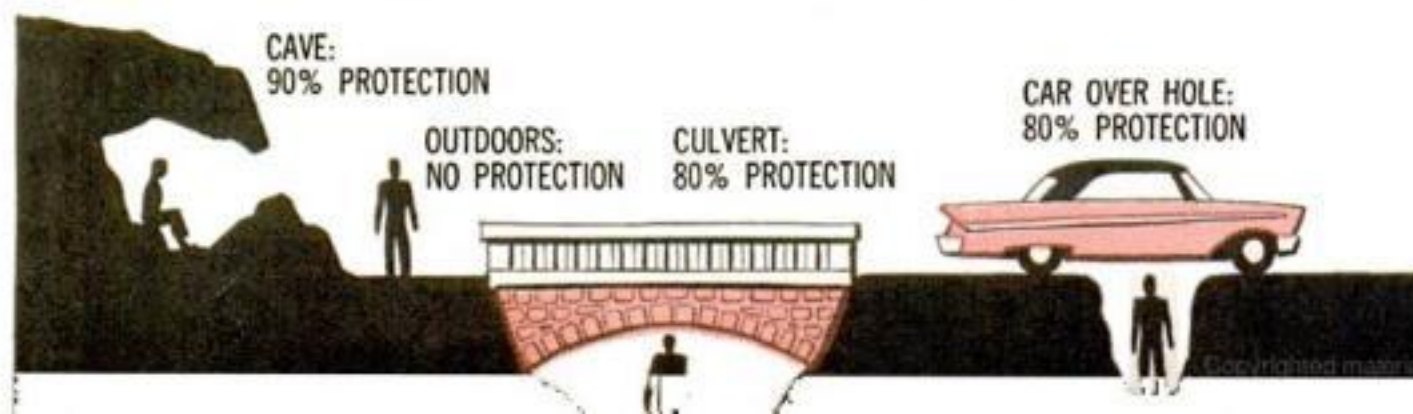
You may be better off in a large group. For one thing, it's likely to include a doctor or at least a trained nurse. But the public shelter must be properly equipped, have room for you—and be close enough for you to reach in time. Chances are, you'll be on your own.

***Don't shelters have to be specially built?***

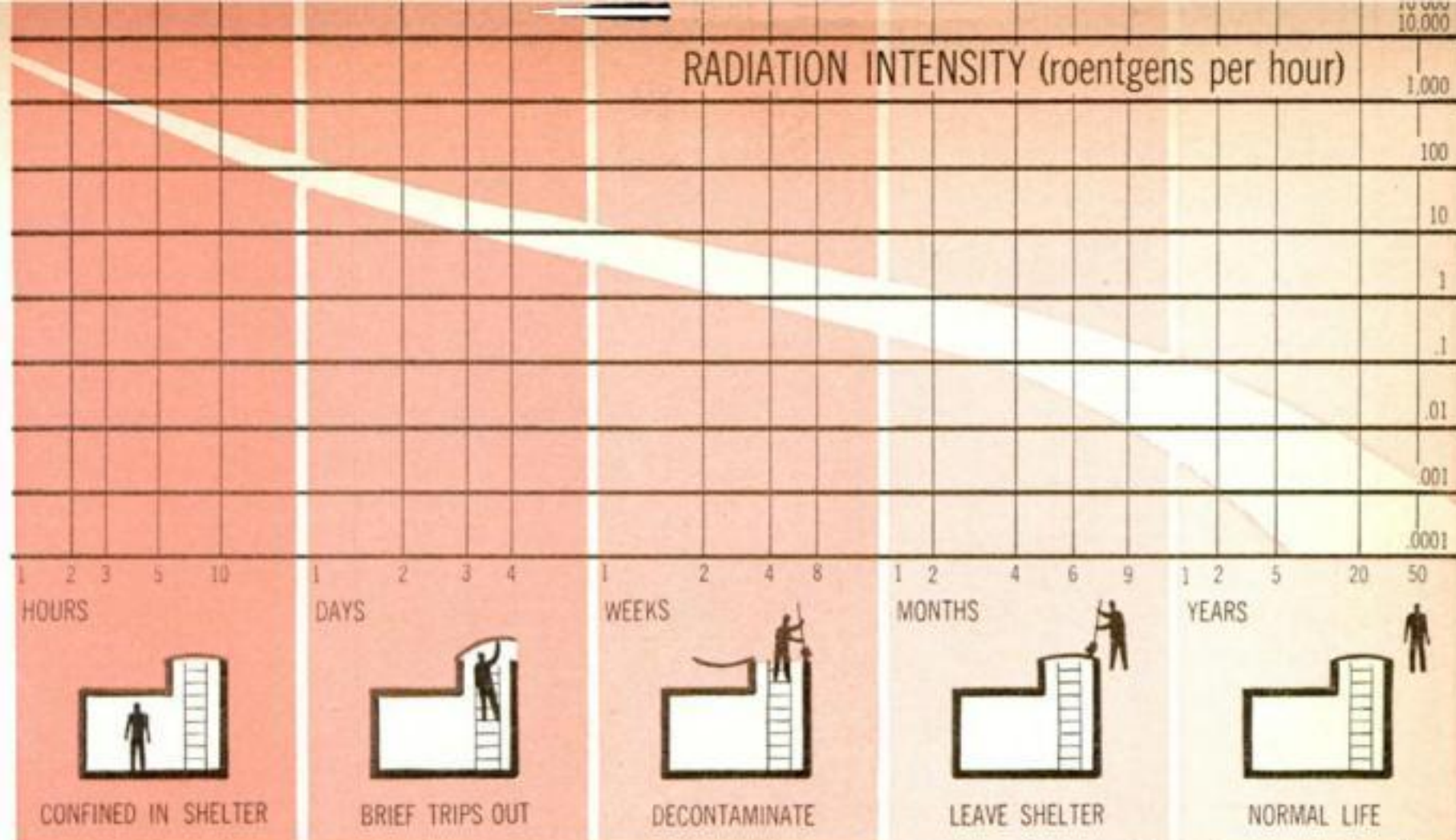
Any covering shields you a little. An

## **Any cover is better than none when the fallout rains down**

Even culvert blocks 80 percent of radiation, but only a windowless, concrete-reinforced-building basement offers real safety (99-percent shielding).







**AS FALLOUT COOLS OFF** and radiation decreases, you can safely leave shelter for longer and

longer periods. Chart is based on fallout that, when fresh, emits 6,000 roentgens per hour.

ordinary frame house blocks about half the fallout's gamma rays. In a windowless underground cellar you are shielded against 95 percent of the radiation. Basements of large, solid structures—apartment houses, factories, office buildings, schools—provide almost total fallout protection.

#### ***Is the 95-percent shielding of your home basement safe enough?***

It's better than nothing but not adequate. You can easily make a corner of your cellar into an excellent shelter, however, by partitioning it off with shielding—heavy walls and a heavy ceiling.

#### ***Does the shielding have to be made of lead?***

No. You can use anything at all: dirt, sand, masonry, sawdust, cases of beer and soda, tanks of water. You just have to be sure you use enough; place so many atoms between you and the fallout that the gamma rays are stopped by these atoms and not by the atoms in your body. You need at least the equivalent in weight of three feet of earth: This may

be two feet of concrete, six inches of steel, five feet of water, nine feet of wood.

#### ***Suppose your house has no cellar? What then?***

You can build a shelter above or below ground, either in the back yard or as part of your house. An underground shelter in the yard is probably best. Don't count on the old "cyclone shelter," though. It's not deep enough underground, nor is it suitable for a long stay.

#### ***A long stay? How long?***

That depends on how much fallout you get. It won't be anything like the World War II blitz, when Londoners slept in the subways and came up days to work. Fallout is dangerous until it cools off, which takes a while. Every sevenfold increase in hours-after-blast reduces radia-

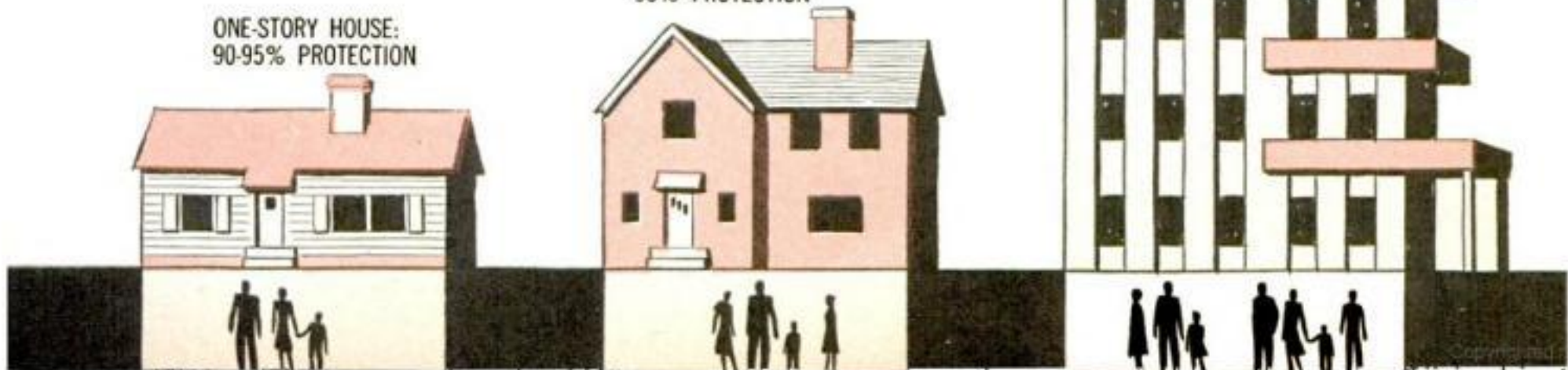
BIG REINFORCED-CONCRETE BUILDING:  
99% PROTECTION

CONTINUED

59

ONE-STORY HOUSE:  
90-95% PROTECTION

TWO-STORY BRICK VENEER:  
95% PROTECTION





tion by a factor of 10: Seven hours after the bomb hits, the level will be 1/10 the original value; 49 hours after, it'll be 1/100; 343 hours (two weeks) after, it'll be 1/1,000. The best guess now is: Prepare to live in your shelter for two weeks. That's a guess.

### ***Two solid weeks in a hole?***

Not solid. After a day, you should be able to leave your shelter area for a walk inside the cellar. The next day you could go outdoors briefly (to empty the garbage cans). Each day later you could stay outside longer and longer. But after every excursion outdoors, you would have to be careful to wash fallout dust off your shoes, clothing, and body—and leave the contaminated wash water outside your shelter.

### ***Will everything be safe two weeks after the blast?***

No telling in advance. Official bulletins over the radio will announce radiation levels, but they may not be accurate enough for your personal area, and you may have good reason to doubt them. To double-check them, you can buy a measuring instrument of your own for about \$25. These are available from firms such as Bendix Corp. (Cincinnati Div., 3130 Wasson Rd., Cincinnati 8) or the Heath Co. (Benton Harbor, Mich.).

### ***Wouldn't a fallout suit help?***

There ain't no such animal.

Any covering—disposable or easily washable materials are best—would keep the fallout dust from sticking to your body or personal clothing, where it is close and very dangerous. But nothing you could wear will stop the gamma rays.

### ***What equipment will be necessary?***

The absolute minimum is two weeks' supply of ready-to-eat food (dry or canned) and water (at least seven gal-

lons per person), toilet pail, garbage can, first-aid kit, warm clothing and blankets, tools, candles, flashlight, transistor radio (with outside antenna connection).

### ***How about air to breathe?***

The ordinary cellar shelter has a shielded doorway but no door. Air from the house will circulate through. An underground shelter needs intake and exhaust pipes (three-inch diameter) with a hand-cranked blower. The intake and exhaust should be capped and screened to keep bugs out, but you do not need a filter. The fallout dust settles quickly, leaving the outside air clean, and you can't suck gamma rays in.

### ***Wouldn't it be better just to load up the car and run for the hills?***

Maybe yes and maybe no. Flight makes sense only if: (1) the place you run to will be safe from fallout; (2) you will have food to eat and a place to sleep when you get there; (3) you can get there quickly enough (the highways will be unimaginably mucked up during and after an attack). You'll just have to trust the authorities—the civil-defense director, police chief, mayor—for this decision. You can't know the answers, and they might.

### ***Is it worthwhile? Wouldn't everybody starve after coming out of the holes?***

Things would be tough, but probably not impossible. Rain would wash fallout away; stored supplies (grain) would be usable. Civilization could be rebuilt.

### ***Is a fallout shelter the best protection against H-war?***

The best protection is prevention—making sure there is no war. But every fallout shelter is one small improvement in our ability to resist attack. The better we can resist, the less the chance that we will have to.

## ***Where to Go for More Information***

If you are serious about building a shelter, write the U.S. Office of Civil Defense, The Pentagon, Washington 25, D.C., for official plans and instructions. Designs for various types are available. Civil Defense also has lists of commercial sources for ready-made shelters and equipment (radiation meters, blowers, vents, etc.).

Before you start work, check the local building code; it may set special requirements. Don't sign a contract until you are certain the contractor is both expert (does his plan meet official standards?) and responsible (how does he stand with the bank and the Better Business Bureau?). For detailed advice on local conditions, ask your local civil-defense director (most towns and counties have one).



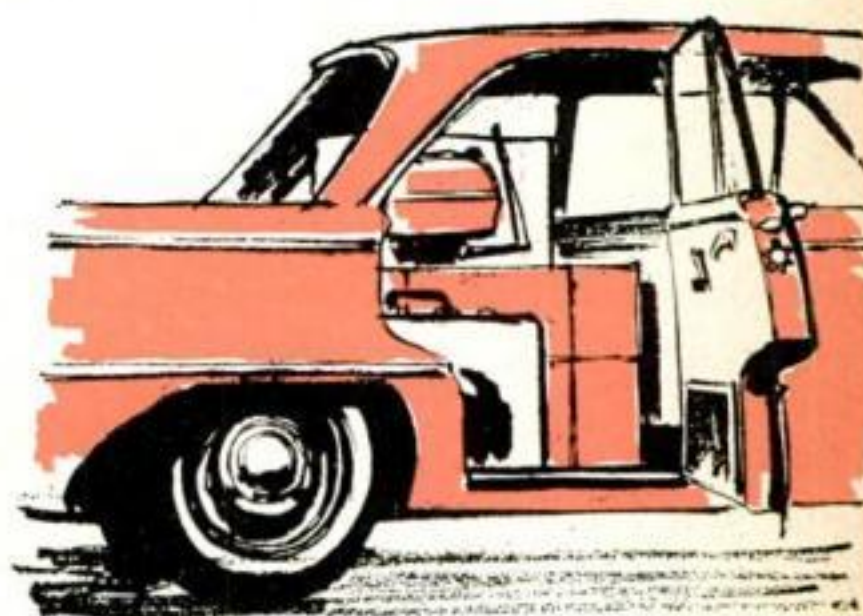
# "I'd like to see them make..."



**BRAKES ON SHOPPING CARTS** so that, when unloading packages on uneven ground, the cart wouldn't suddenly roll away from you and bang into the car.—*L. D. Kurtz, Greensburg, Pa.*



**HEAVY-DUTY MULTIPLE-OUTLET BOXES** something like a photographer's light box, for plug-in cooking at the table. Ceramic tile would look good.—*H. Kearney, Elizabeth, N.J.*



**A DEFLATABLE REAR SEAT** in sedans. This would give you more luggage space for use on long trips or make extra room for hauling bulky objects.—*F. J. MacDonald, Fairmont, W. Va.*



**AN ERASABLE WRITING PANEL** on a camera, like those photographers have on film holders. You'd use it to record film type and similar data.—*A. E. Ortner, Brooklyn, N.Y.*

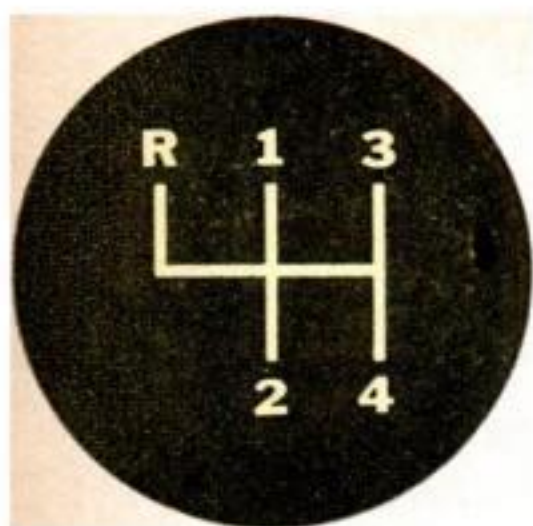


**A SCORING TOOL** for seating plaster in cracks. You'd open the points the desired amount to cut a "dovetail" groove as you ran the tool down the crack.—*E. Hess, South Amboy, N.J.*

Everyone has his own pet idea of a gadget that he would like to see in general use. What's *yours*? We will pay \$5 for each one published. Please use Government postcards

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# What's So Good About 4-Speed Boxes?

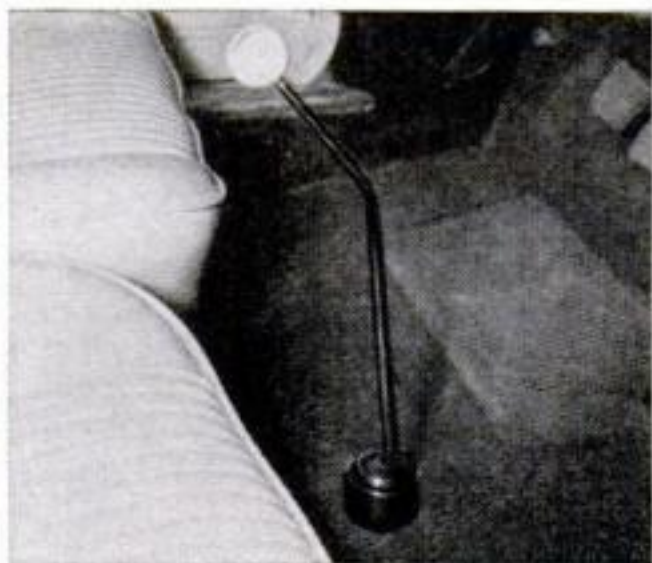
*After 30 years motorists are buying them again—for some surprising reasons*



**BUICK SPECIAL**



**CHEVROLET**



**CORVAIR**



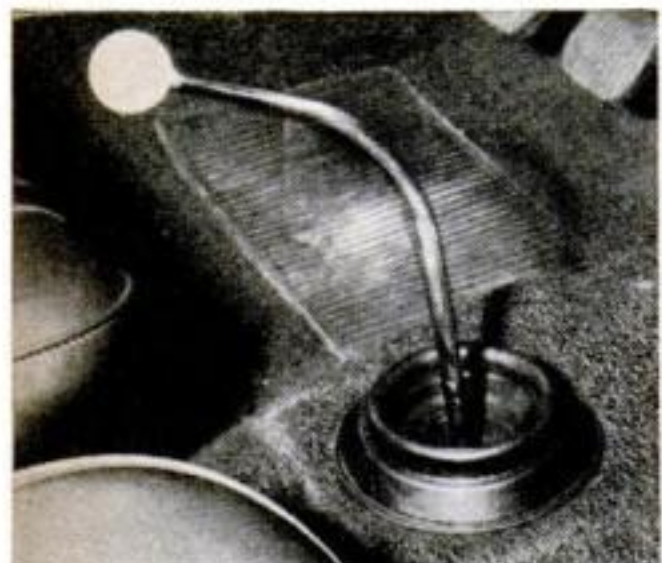
**CORVETTE**



**FORD**



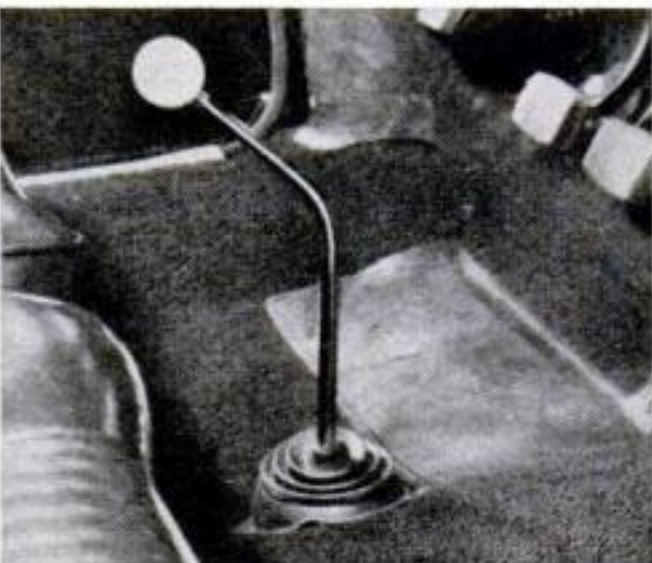
**HAWK**



**OLDS F-85**



**PONTIAC**

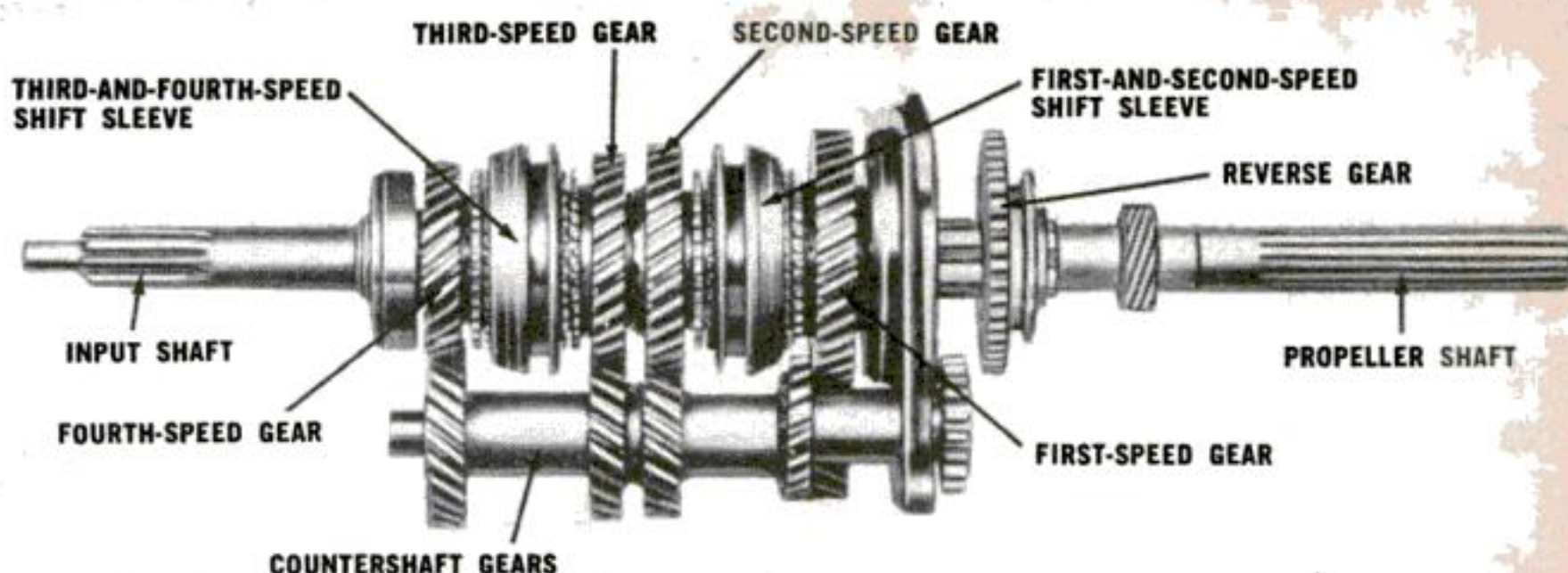


**TEMPEST**

**FLOOR SHIFT**, a new status symbol in car ownership, is installed with varying degrees of floppiness. Stick is put on floor, however, for a good reason: The complex linkage of a column shift is less positive than a floor stick, and tends to

get even sloppier with wear. Typical shift pattern (inset at top of page) is always posted somewhere in driving compartment—either on tunnel or shift knob. Low, which is the key gear, ranges from 2.20:1 to 3.65:1.





**DESIGNING A FOUR-SPEED TRANSMISSION** is simple—just add one gear to drive-train shaft and one to countershaft beneath. Unsynchron-

ized reverse gear has sliding engagement. Some four-speeds have reverse in separate, low-slung housing to keep down length of floor tunnel.

### By Devon Francis

**D**URING the 1920s a select few U. S. cars came equipped with manual transmissions having four forward speeds. They gave a car wings. They were smart. They were even snobbish.

Today, notwithstanding the tens of millions of sophisticated automatic transmissions on the road, yesteryear's manual multispeed transmission has come full circle. The four-speed box is back in the family sedan. It still makes an engine bellow. It's still smart. It certainly retains its snob appeal.

The reason assigned for the return to favor of the four-speed stick depends on who is doing the explaining.

The champions of gearshifting say that at long last the little old ladies have been fired from the councils of Detroit's drive-train designers. An antigearshift crowd argues that automotive beatniks have taken over.

In between is a more conservative, and probably more realistic, opinion. It holds that the automobile manufacturers finally have begun to restore the fun to motoring for that segment of the public that loves to run its machines.

The popularity of the four-speed, fully synchronized box is spreading. Almost one out of every five Chevrolet Corvairs being sold is equipped with a four-speed box. For 1962, the optional four-speed, with a rakish floor-mounted shift lever, is being offered by the Ford Galaxie, the Studebaker Hawk and Lark Daytona

models, the big Pontiac and the Tempest, the Oldsmobile F-85, the Buick Special, Corvette, Corvair, and the big Chevrolet.

The Corvair and the big Chevrolet got a head start on the four-speed during the 1961 model year. Few, it is true, appeared in the big Chevies. Detroit's seers believe, though, that the percentages will keep climbing.

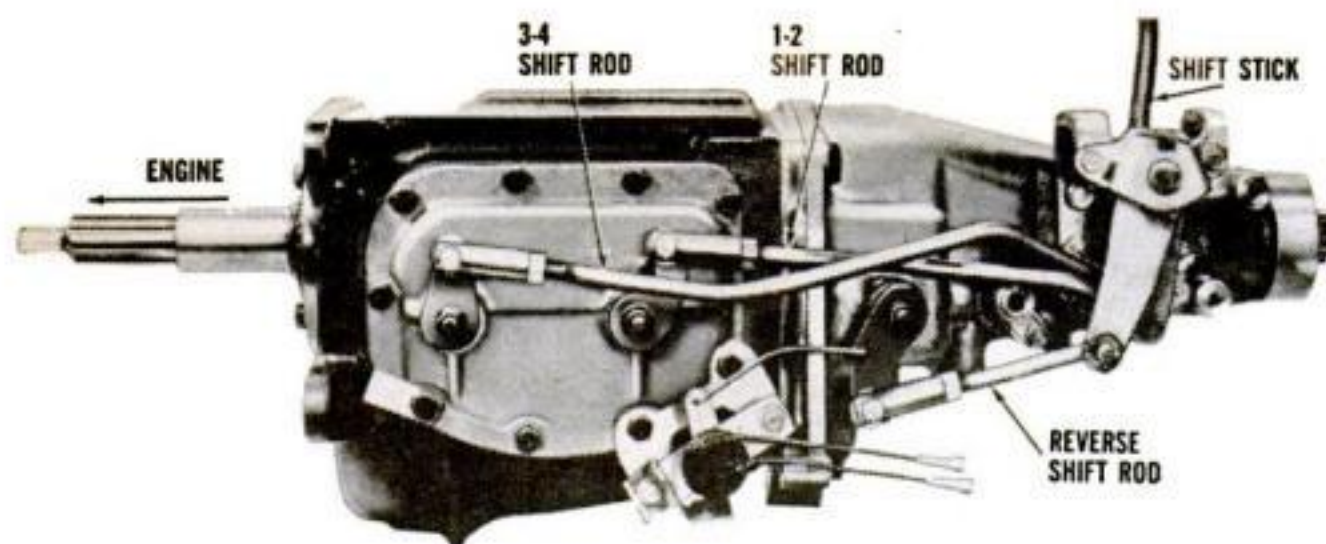
**That whoosh performance.** With the lustier engines, the four-speeds really go. The 390-cu.-in. Ford isn't yet out of second gear when it sizzles through the 60-m.p.h. mark on the speedometer in seven seconds. It has not yet paused for breath when it tops 90 in third. But even with a small engine, which makes no pretense at scalding acceleration, a four-speed is a definite advantage.

The fundamental appeal of the four-speed to the ordinary motorist is something more, however, than acceleration from the stop light. It is an appealing mix of "support gears." At a highway speed of 65, most automatic boxes are beyond the point where a downshift, induced by a hard boot on the accelerator, will do much good for passing. A three-speed manual box is past its capabilities in second.

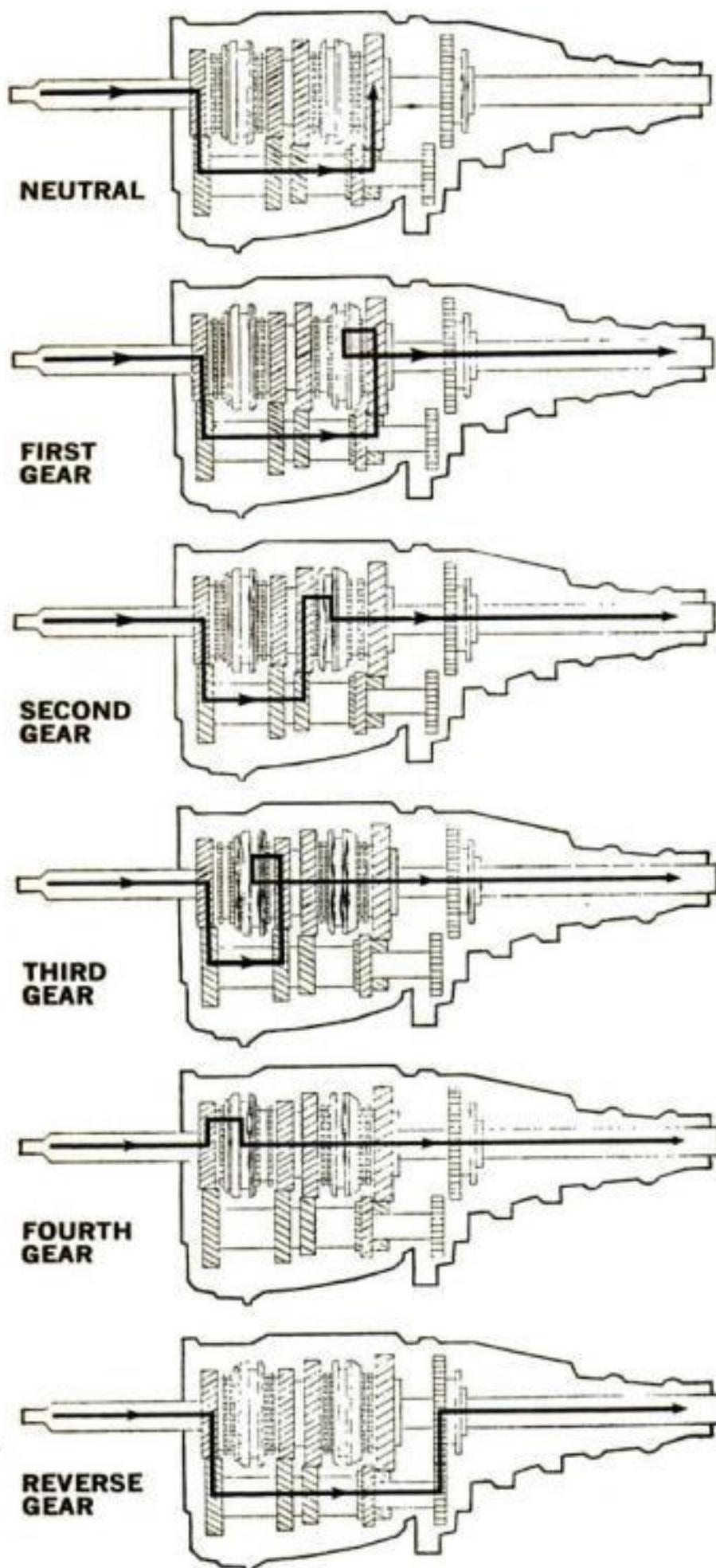
But third speed in a four-speed box is just the prescription for getting out and around.

Where a three-speed will lug in high as traffic slows, and second gear is an engine-racing irritant, the four-speed displays an outright arrogance in the ease with which it slips down into a lively third or, if need be, a boisterous second.





**ADDITIONAL SHIFT ROD** is necessary for the extra gear of the four-speed box. Each forward-speed rod, responding to shift lever "indexing," takes care of two gear ratios. All four-speed boxes with exception of Chevy Corvair and Pontiac Tempest are available only with a V-8 engine.



**POWER-FLOW PATTERNS** are shown in these drawings from neutral (top) through first, second, third, fourth gears, and reverse. Countershaft and main shaft gears are in constant mesh. A main gear freewheels until shift rod moves sleeve to lock it to output shaft.

**Braking through the gears.** The support gears are ideal for decelerating on slippery footing. Downshift, and engine drag slows you.

Also, a four-speed permits a numerically lower axle ratio. On the open road that means more m.p.g. It's nearly as economical as the overdrive, but without the penalty of brake-eroding freewheeling at lower speeds.

It can't be denied that the four-speed transmission's most insidious appeal is to the hot-rodder. Teamed with a lot of power and tailpipes that are pure Beethoven, it leaves everything else at the light.

Hot-rodders install cams with lobes that give higher lift and longer dwell periods so that the intake and exhaust valves have more overlap. Hydraulic valve lifters are replaced with solid ones. Otherwise, at the 6,000-plus r.p.m. that the performance-bent car owner demands, the valves would float—poised between their fully open and fully closed positions. The spark-advance curve undergoes surgery to make the air-gas charge fire sooner before top dead center. Performance requires a bagful of gears stepped in close ratio from first through fourth.

The transmission itself is different from the three-gear jobs. While the design calls simply for adding the gears to accommodate four forward speeds, two more synchronizing rings must go into the gear nest so that changing gears is clash-free, whether upshifting or downshifting. (Low gear on three-speed transmissions is, of course, unsynchronized.) Gears are heftier to take outsize torque loads. Often a higher-capacity clutch is put ahead of the transmission to absorb the power from the engine.

**How to drive the four-speed.** As a performance box, the four-speed has to be used differently. Gears are shifted not



Buyer's Guide to Four-Speed Transmissions	TRANSMISSION PRICE	TRANSMISSION GEAR RATIOS :1 (1st, 2nd, 3rd) (a)	AXLE RATIO :1	OPTIONAL AXLE RATIOS :1	HP. @ R.P.M. AND OPTIONS	TORQUE (LB./FT.) @ R.P.M.	STANDING-START 1/4 MILE (SECS.)	STANDING-START 1/4 MILE (M.P.H.)
BUICK SPECIAL	\$199.80		3.08 (b)	2.78 3.23 3.90 4.30	135 @ 4,600 155 @ 4,600 185 @ 4,800	205 @ 2,400 220 @ 2,400 230 @ 2,800		
CHEVROLET	\$188.30	(c)	3.36	4.56	250 @ 4,400 300 @ 5,000 380 @ 5,800	350 @ 2,800 360 @ 3,200 420 @ 3,200		
CORVAIR	\$ 64.60			3.89 3.55	84 @ 4,400	130 @ 2,300		
CORVETTE	\$188.30	(d)	3.36	3.08 3.36 3.55 4.11 4.56	250 @ 4,400 340 @ 6,000 360 @ 6,000	350 @ 2,800 344 @ 4,000 352 @ 4,000		
FORD	\$188			(e)	300 @ 4,600 375 @ 6,000	427 @ 2,800 427 @ 3,400		
HAWK	\$188.30		3.31	3.73	210 @ 4,500	300 @ 2,800		
LARK	\$188.30			3.73	195 @ 4,500 180 @ 4,500	265 @ 3,000 260 @ 2,800		
OLDS F-85	N.A.	2.54-1.92-1.51	3.08	3.36	185 @ 4,800 155 @ 4,800	230 @ 3,200 210 @ 3,200	N.A.	N.A.
PONTIAC	\$231.34		3.23	3.42	235 @ 3,600 303 @ 4,600 318 @ 4,600 333 @ 4,800	402 @ 2,000 425 @ 2,800 430 @ 3,200 425 @ 2,800		
TEMPEST	\$172.80			3.5				

Note: Quarter-mile performance figures are with 300-lb. load. Numbers in color indicate axle, horsepower, and torque combinations used in each test. (a): Fourth gear is 1:1. (b): 3.36 on Skylark. (c): Optional ratios: 2.20-1.66-1.31. (d): Optional ratios: 2.54-1.92-1.51. (e): Thirteen ratios, from 3.22 to 5.93. N.A.: Figures not available.

by road speed but by engine r.p.m. The practiced driver revs high in each transmission gate. An engine tachometer is dear to his heart. He goes up to and past the point where his horsepower peaks.

If he breaks traction—pulls his hot right foot back out of the carburetor and throws out his clutch—too soon, he loses too many engine revolutions, and thus horsepower, between shifts.

*Who buys 'em?* Though the hot-rodder is the only readily identifiable driver who is passionate on four-speeds, thousands of shadowy-faced motorists are buying the low-horsepower, modest-performance four-speed automobiles, such as the Corvair.

Detroit abounds with stories about four-speed owners. There is one concerning an official of the Salvation Army who owns a standard Chevy with a four-speed box. Cautious, a splendid driver, he's never had a traffic ticket in his life. He just likes to shift gears.

Another four-speed man is a clergyman.

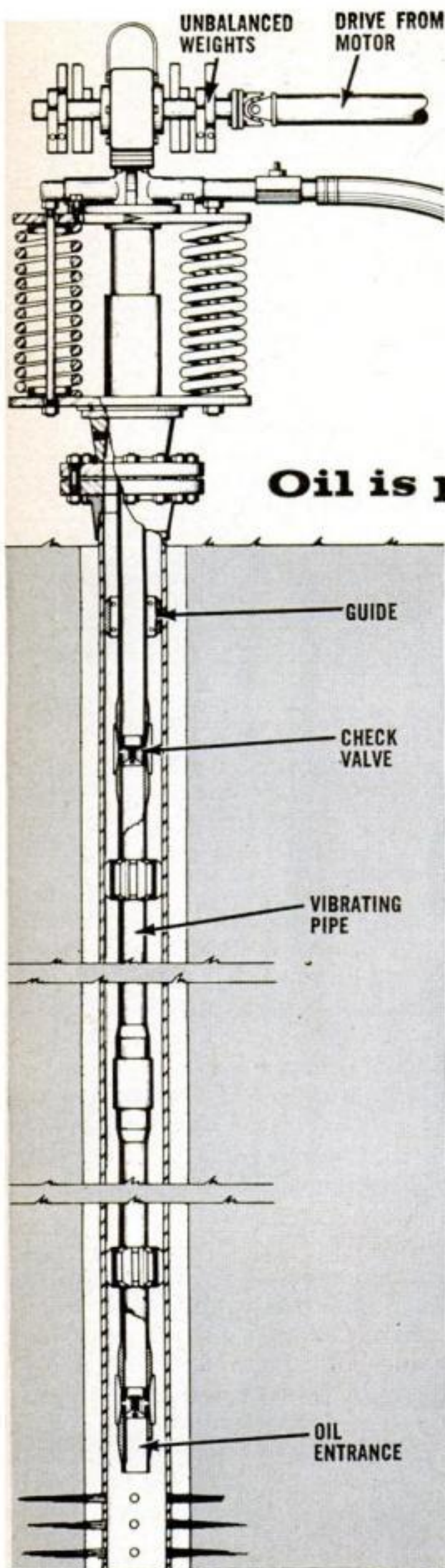
He bought the biggest engine he could get to put ahead of that multigate box. Asked why, he made a similar reply: He just likes to listen to his tailpipes and shift gears. The same two men, no doubt, enjoy the bite and aroma of a table saw ripping up a piece of Ponderosa pine.

Whoever the customers are, the fact remains that up to now neither Chevrolet nor Ford has been able to keep up with its orders for four-speed manual transmissions.

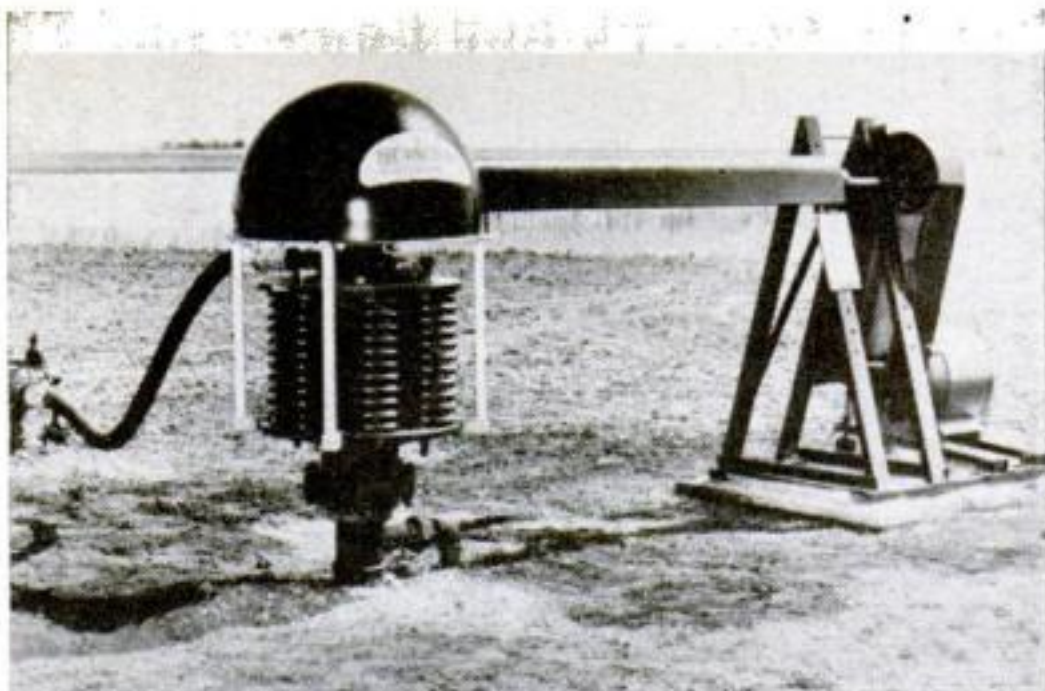
*How the craze started.* Why Detroit began turning out these five-gate (including reverse) boxes with floor-mounted sticks for regular passenger cars is easier to relate than who buys them. The spate of European imports, multigearred because of their low horsepower and torque outputs, evidently had little to do with it. None of the U. S. compacts that appeared in the 1960-61 model years offered a four-speed. Three-speeds did flourish; they offered economy.

[Continued on page 200]





**OIL IS LIFTED** section by section past check valves as sound waves vibrate the long steel pipe.



**UNBALANCED WEIGHTS** under the dome-shaped shield are spun by motor at right to vibrate the well pipe.

## Oil is pumped by sound waves

Make an organ pipe pump oil? Johnston Testers of Houston have done almost that with a new kind of pump—smaller, lighter, and more efficient—that works with sound waves. An electric motor spins unbalanced weights to vibrate a long steel well pipe at its natural harmonic frequency, generating sound vibrations. These rapid up-and-down vibrations raise oil through a series of check valves. A string of pipe 1,425 feet long vibrates at 330 cycles, humming E above middle C.



## Canal bridges Dutch expressway

An aqueduct carries canal boats over a sunken section of road between Amsterdam and Rotterdam. It was simpler and cheaper than digging a tunnel or building a four-lane bridge. The reinforced-concrete aqueduct has a narrow waist to lessen the amount and weight of water it carries.

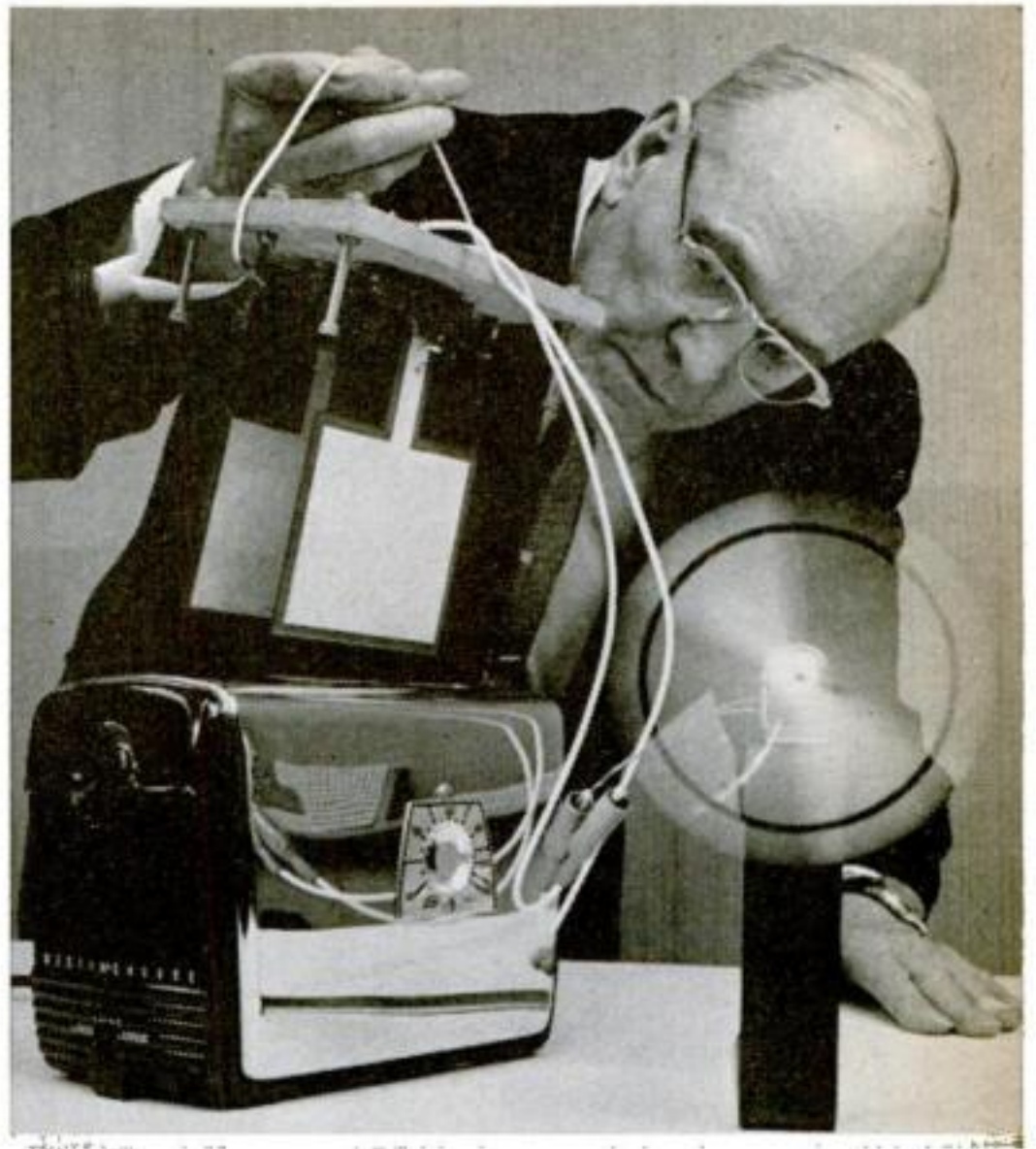




### Restaurant crowns huge water tower

The funnel-shaped tank of a new water tower at Orebro, Sweden, not only holds 2,000,000 gallons, but has a restaurant on top. The dining room is reached by two elevators and a spiral staircase in the stem.

Standing 190 feet high, the 3,200-ton concrete tank was cast on the ground. Then it was inched up by 29 hydraulic jacks while the column was being built from the inside out. The foundation is sunk 32 feet into rock.



### Hot porcelain runs fan

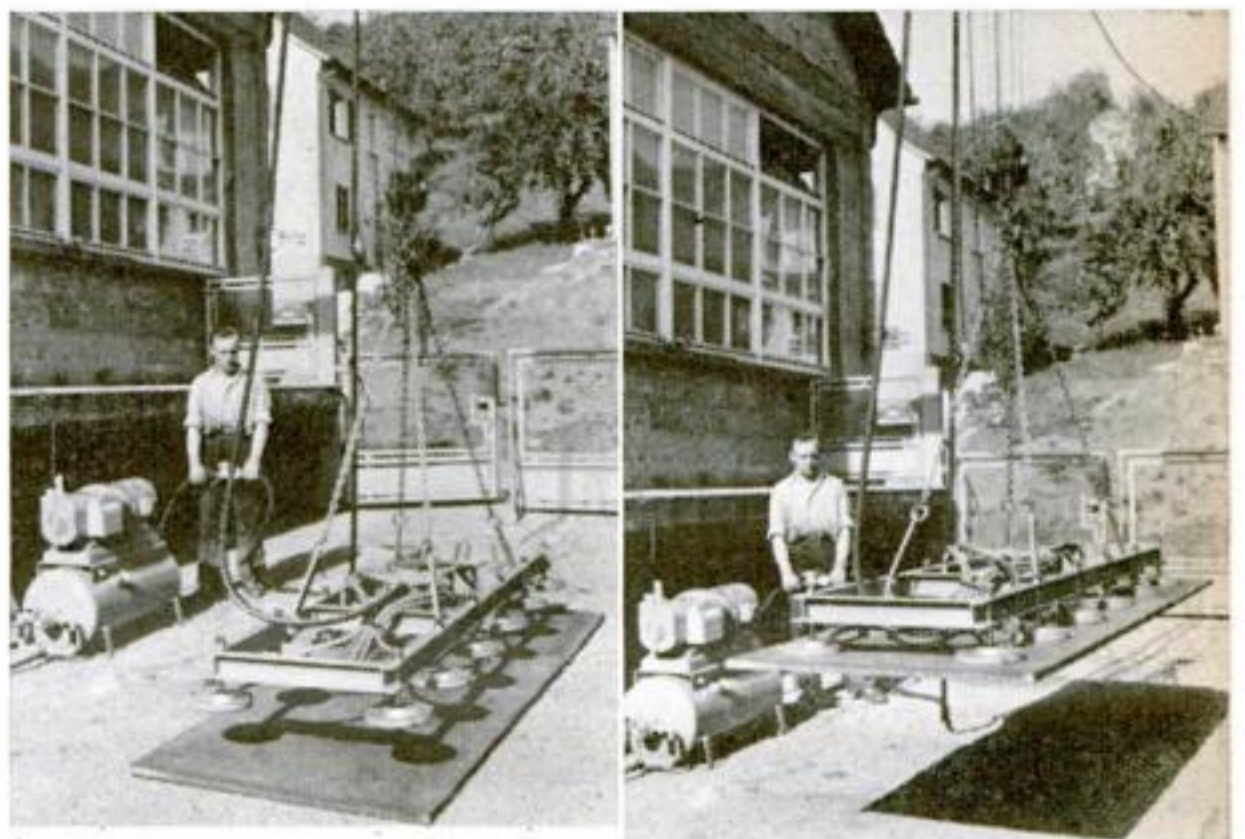
Those two squares of porcelain enamel above are a promising new kind of battery. Heat them in a toaster and they generate electricity to run the fan, right. The enamel becomes an electrolyte when hot enough (above 500 degrees). Then a reaction between the enamel's steel base and a silver coating makes the juice.

Westinghouse, where B. O. Austin (above) accidentally discovered the "Austin effect," is pushing it as a spacecraft power source. The plates could form a rocket-engine's thrust nozzle, which is often made of enameled metal anyway.

### Pickup by suction cup

Vacuum cups attached to a frame make up a new lifting device used in West Germany. They act like a strong magnet but work on wood, plastic, glass, and rubber, as well as on iron or steel, if the surface is fairly smooth.

The cups and frame are lowered by crane onto the object to be lifted. Air is sucked out of the cups by a vacuum pump to establish a grip. Then the crane lifts and moves the object. A release frees the cups for a new job.



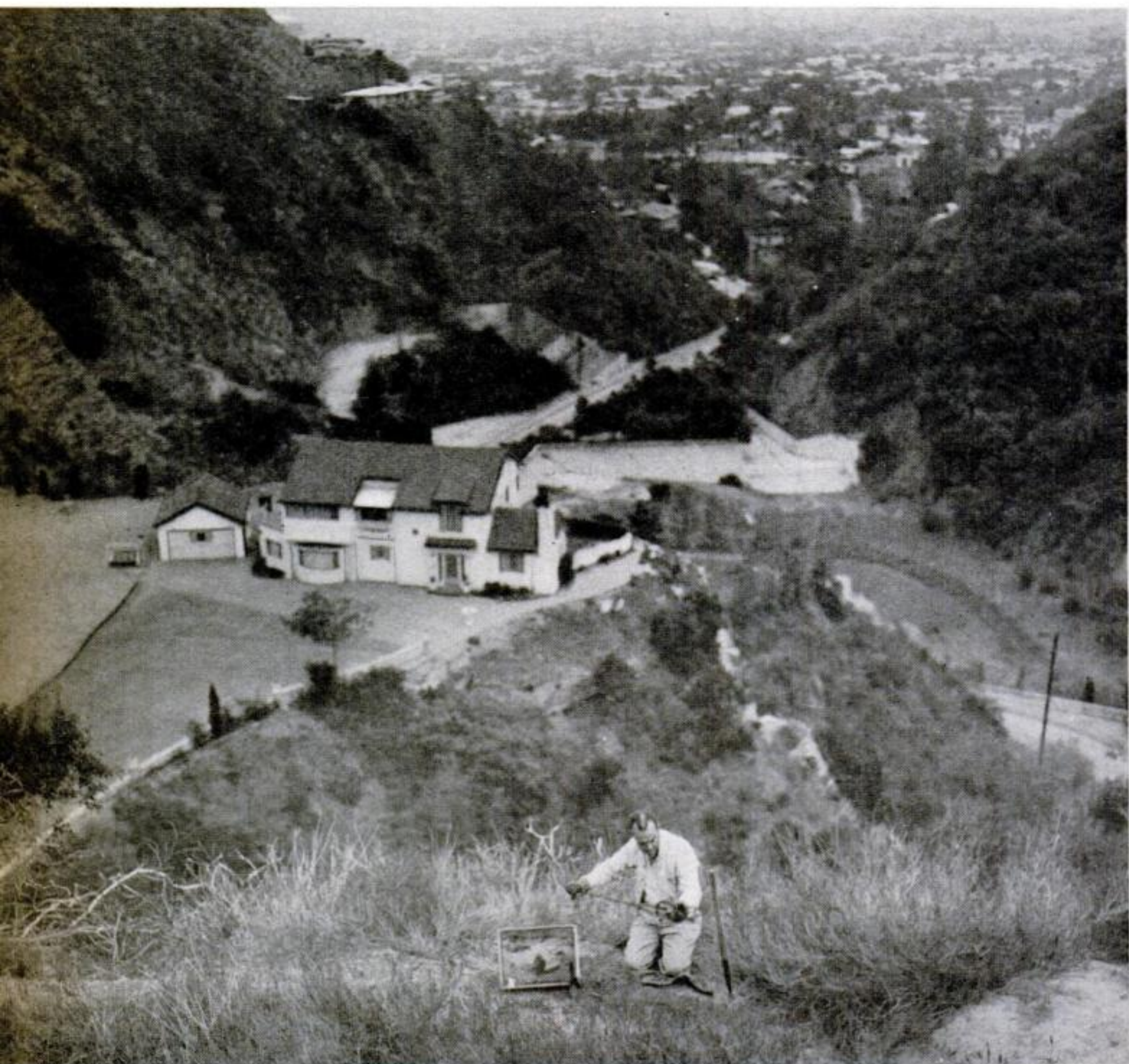
Vacuum cups lowered onto plate . . . take firm hold to lift it.





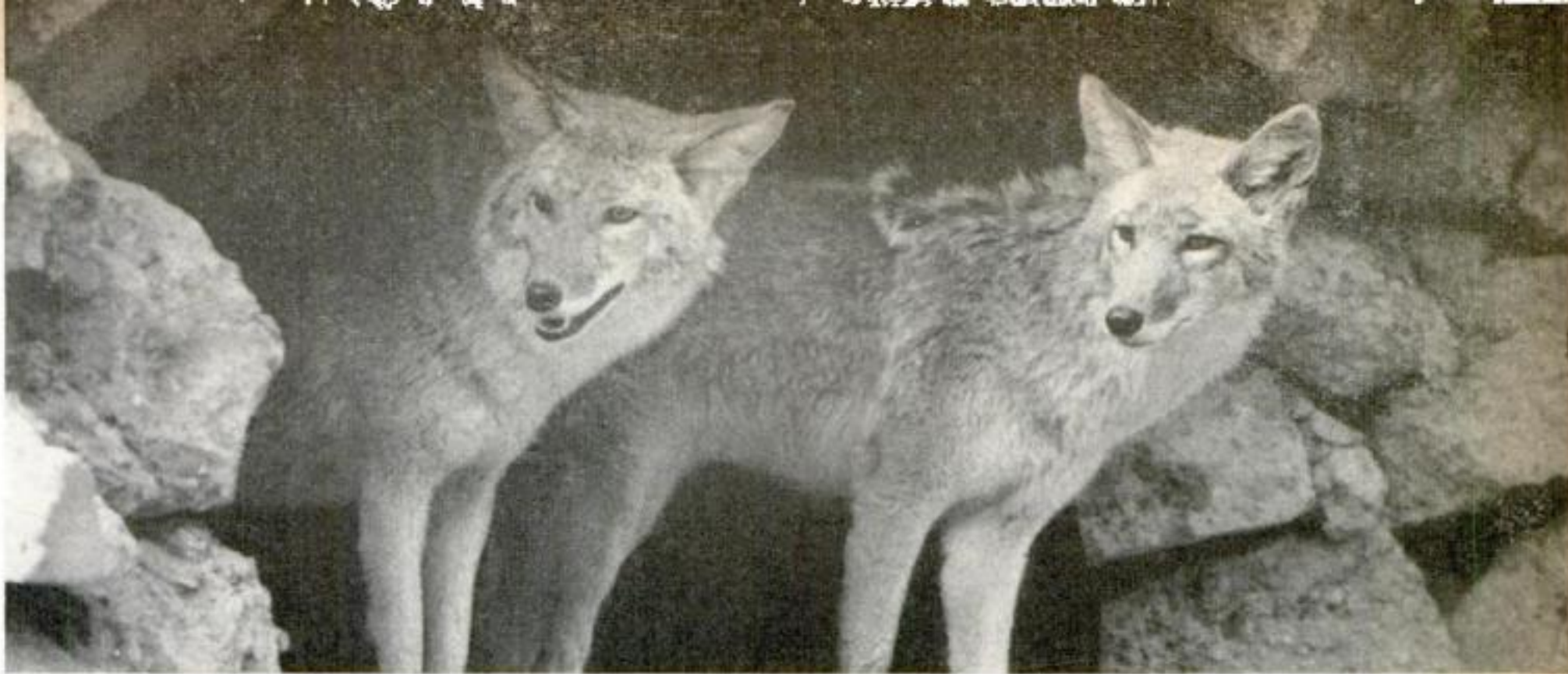
# Thar's Coyotes in Them Hollywood Hills

*Sly, sassy, and smarter than a fox,  
they are flourishing smugly in the midst  
of the third most populous U. S. city*



**NEAR SWANK RESIDENCES** around Hollywood Blvd., Renny McEvoy sets a trap for coyotes, which share the hilly, canyon-creased area with some famous two-legged neighbors.





**UNLIKE ITS DOG COUSINS**, the coyote is faithful to its mate. The family hunts together until

the pups are old enough to go it alone. This photogenic pair lives in San Diego Zoo.

### By Wesley S. Griswold

**W**HAT can you do about a predatory animal so clever that it can open a pedal-operated refrigerator door and steal the food inside?

A California coyote did that to a whole row of back-porch refrigerators—and got away with it.

It's harder to catch a coyote red-handed than to hold a greased pig. What other animal feels for buried traps as delicately as any soldier ever searched for a land mine—and when it uncovers the tiniest rim of metal, avoids the area like poison?

How do you stalk an animal with a nose so keen that it can hardly ever be deceived? An animal so aware that its nose is its best friend that it stays home on windy days, knowing it would be at a disadvantage then? An animal with, you're almost willing to believe, a sixth sense that warns it of danger even when its bad eyes and marvelous nose can't detect anything amiss?

How do you nab a four-legged prowler that cases a joint as carefully as any cat burglar, sometimes scouting a neighborhood for three days before choosing the right moment to make a killing?

People are seeking the answers to those questions right now in, of all places, the city of Los Angeles.

Coyotes were there before the first settlers arrived. A good many are still around, hemmed in now by the third most populous city in the U. S. But they may not be there much longer. Civiliza-

tion is in the process of cornering them.

Bulldozers have heaved them out of ancestral lairs in Chavez Ravine, a short hop from City Hall, to make way for the Dodgers' new stadium. Mechanical cats have clawed them out of favored dens beneath tree roots in the Santa Monica Mountains, where the San Diego Freeway is going through.

**Coyotes' last stand.** The Hollywood Hills are still full of coyotes. But as successive waves of human settlers wash higher up the slopes of those hills, what was once an agreeable wilderness is becoming severely limited. Los Angeles citizens who dwell on the higher perches of the hills have been coming into more and more frequent contact with coyotes. Frankly, they don't much like it.

Coyotes do far more good than harm, being on the prowl night and day for rats, mice, snakes, and ground squirrels. They would be happy to settle for peaceful coexistence with the people of Los Angeles. Unfortunately, a lot of people don't feel the same way about it. Coyotes have developed such a fondness for cats and dogs and feathered pets that the predators have almost lost their old zest for rodents.

Five cats disappeared from Pacific Palisades households in one recent week, leaving no clues but coyote tracks.

One man in East Los Angeles has lost four dogs to coyotes within the past six years. He saw a pair of coyotes grab his last pet, a toy poodle. They attacked in daylight, within 75 feet of his back door.

Another citizen, invalided with heart





**THIS 52-POUND COYOTE**, bagged near the summit of the Hollywood Hills, was the biggest that Renny McEvoy has ever caught there. It took an intensive three-week campaign to get him.

trouble, watched three coyotes come right up on the porch and kill his cat. Local game authorities have such respect for the coyote's intelligence that they are certain those particular animals knew that the cat's owner was helpless; otherwise they wouldn't have been so bold.

**A cruel ambush.** Coyotes, like wolves and foxes, are members of the dog family. Sometimes they take advantage of this fact in a cunning way. They have been known to send out one of their females to lure an amorous dog into ambush, where a waiting pack of male coyotes has torn it to pieces.

Not all female coyotes lend themselves to this vicious trickery. One even peaceably let herself be brought into a Los Angeles dog pound by an inspector who thought she was a dog and handled her as one. Quite a few female coyotes have mated with dogs. People have sometimes made pets of the mongrel offspring. This is not a good idea, coyote experts say. No wild animal, or even a half-wild one, can be relied on to become fully tamed.

Coyotes are generally buff colored, with grayish, grizzled heads. They look like undersized, apprehensive German

shepherd dogs, except that their tails are round and bushy. An average adult is four feet long, weighs 30-40 pounds, and lives about as long as a dog. Unlike their dog cousins, male coyotes are not born philanderers. They usually remain faithful to their mates.

Coyote families stick together and prey together until the pups are sufficiently trained to hunt for themselves. The youngsters even have to learn to howl. One coyote stalker says he once heard a whole litter of them practicing. First the parent, probably the mother, would give out with the wailing, doleful wuh-wuh-whoooo so long familiar to travelers in Western wilds. Then a thin chorus of high-pitched voices would try to imitate it. "Sounded like a bunch of soprano dogs," the stalker reports.

Female coyotes produce only one litter a year, in April or May, but that's quite enough to keep the population booming. Litters regularly number from 8 to 10 pups. One fantastic brood in the Santa Monica Mountains contained 19.

**They're not fussy eaters.** Practically anything, ranging from deer to field mice, including fish, fowl, fruit, and vegetables, makes up the coyote's diet. The wily predators have a special fondness for things that smell to high heaven, and that has led them to raid Los Angeles picnic grounds and back alleys for garbage.

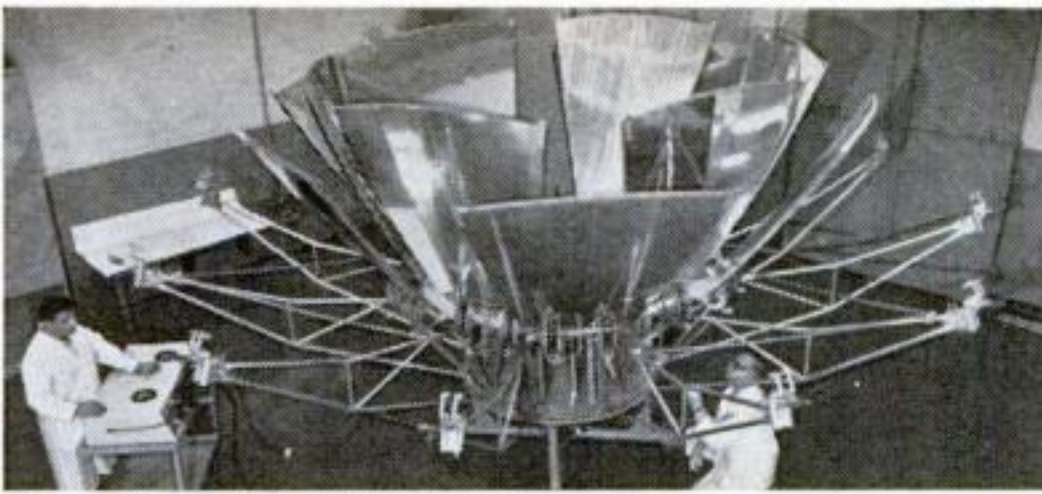
The fact that Southern California has been suffering from an unprecedented drought has roiled human-coyote relations. The coyotes' natural prey has crept down from the hills into the encircling communities in a desperate hunt for water. Coyotes, of course, followed.

They have been seen drinking out of swimming pools and enjoying lawn sprinklers. One showed up at a garden party. Though they get about town largely through storm drains, occasionally one is flattened on the Hollywood Freeway. Another was briefly marooned on the median strip of the San Bernardino Freeway during a recent afternoon rush hour. It managed to streak through one stream of traffic without getting clipped.

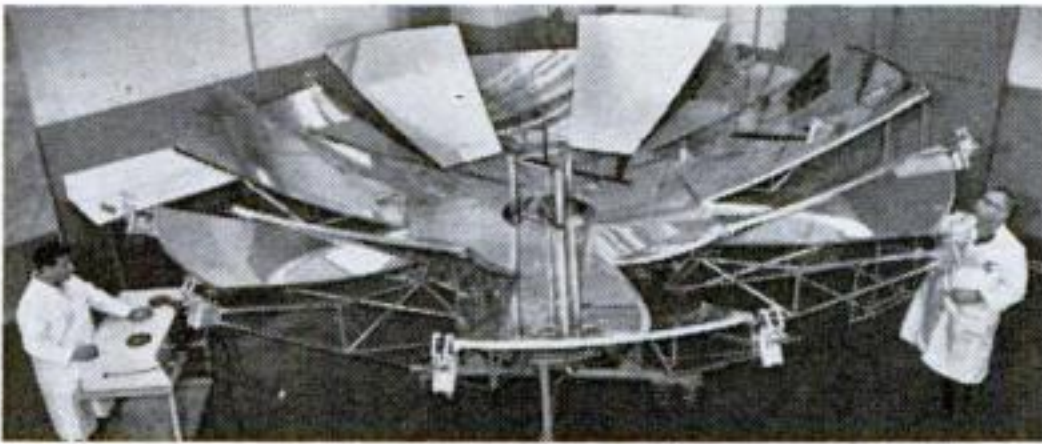
**Children were stalked.** A housewife in the Hollywood Hills was horrified one morning to see a coyote trailing a neighbor's little girl who was carrying her lunch in a paper bag. It was doubtless the

*[Continued on page 198]*

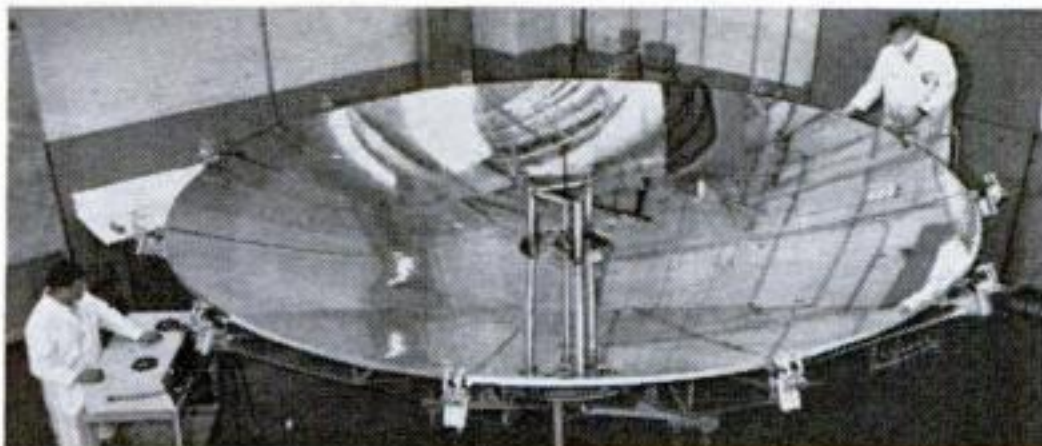




Space flower's petals close in rocket nose . . .



. . . then begin to open when triggered in space . . .



. . . and in full bloom become parabolic mirror.

## Mirror "flowers" in space

The petals of a new collector of solar energy, designed for spacecraft launched by the Air Force, fold to fit in a nose cone when going through the earth's atmosphere. When in orbit, they would open into a 16-foot parabolic mirror.

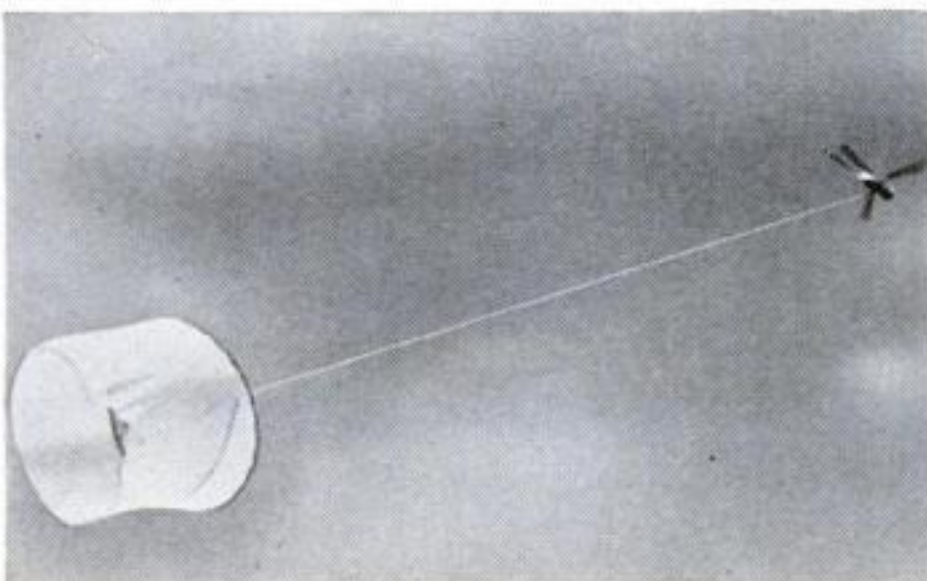
The prototype model above is being tested at GE's missile and space facility at Phoenix, Ariz. The aluminum-coated mirror would concentrate the sun's heat for conversion into electricity.



## Diagonal safety belt

Three-point anchorage for a new British seat belt is on the drive-shaft tunnel and door sill for a lap strap and on the roof pillar for a diagonal strap across the outside shoulder. A single buckle fastens it. The belt on the floor in the photo above is for the left front seat.

On sports cars and convertibles, which have no door pillars, the upper end of the diagonal is anchored to the rear-wheel well.



## Fishing by helicopter

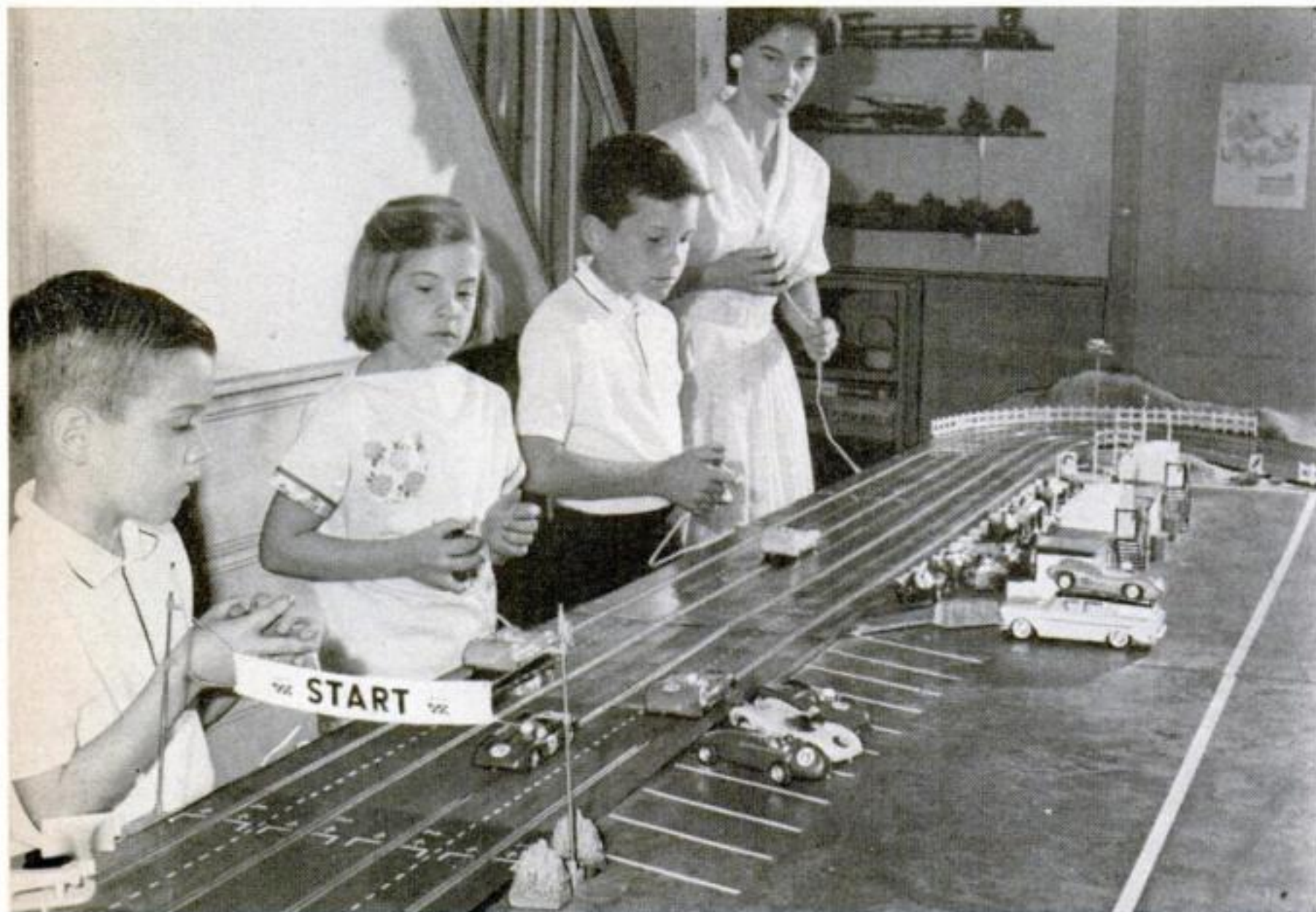
When the University of Texas Institute of Marine Science asked for help to take a fish census, the Navy came through with a helicopter.

As shown in the photo at left, a 650-pound net is lowered into Corpus Christi Bay. Scientists rush to the scene by boat and count the fish as they drop out through a small trap door when the net is hauled up. Using a power boat to lower the net would cause the fish to scatter.



# Tiny Race Cars Give Full-Size Thrills

**CHEV, JAG, AND TWO MERCEDES-BENZ'S** by Aurora cruise along a four-lane highway. Two cars, roadway, power pack cost \$25.



**LEADING THE PACK** past pit area is miniature Aston-Martin made in England by Scalextric. Eight Grand Prix and competition models are offered. Prices start at \$40 for two cars and

basic equipment, but elaborate setup pictured cost several hundred. While owner Harry Derby of Rye, N. Y., is at the office, his family sneaks in a few hot practice laps.

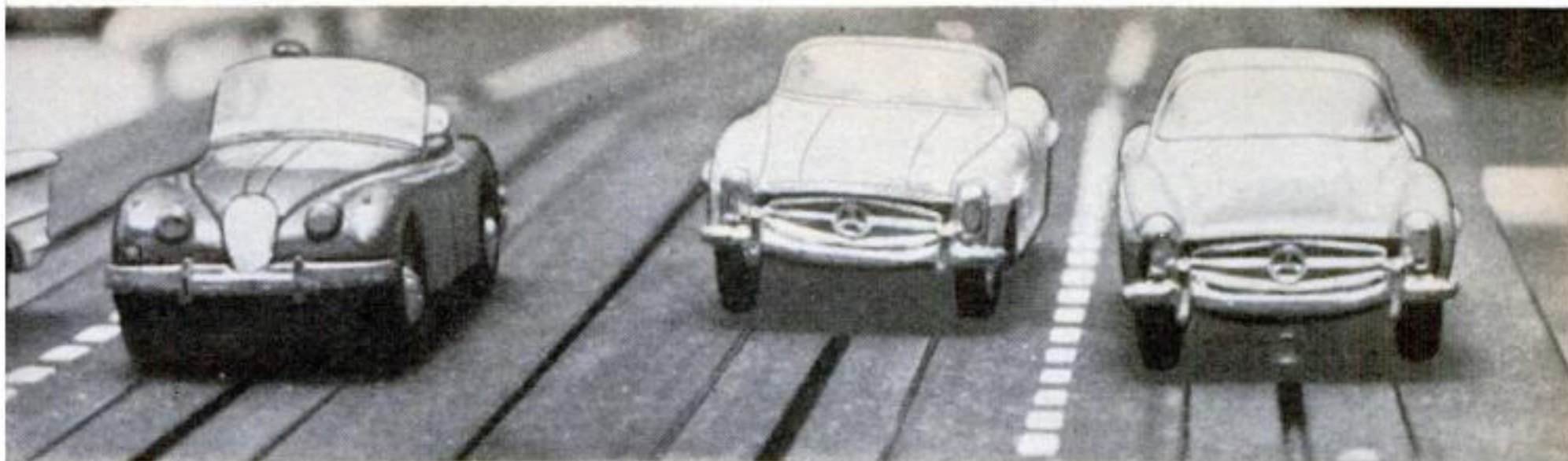


**WARNING LIGHT**, Derby's own innovation, glows when the power packs are on. Two packs are used here—one for each two-lane roadway.



**CAR'S GUIDE POST** slips between the contact strips. Wire brushes on either side of the post pick up current. Car is a Scalextric Cooper.





**Grown-ups and kids alike are testing their driving skill with these 160-scale-m.p.h. models**

**By Alex Markovich**

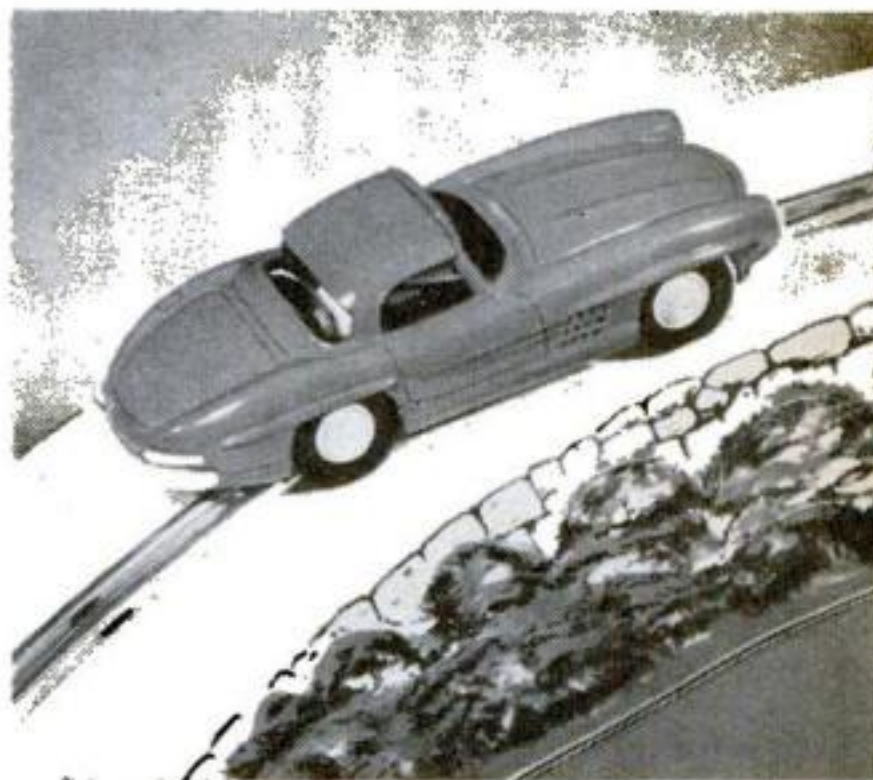
**T**HE long, sleek Grand Prix Vanwall blazed down the straight, trailed closely by the smaller Lotus. The first of the treacherous esses was dead ahead.

The Vanwall shut off just as it entered the sharp right turn. Its rear wheels drifted out, setting up the proper line for the next turn. The Lotus flashed in on the outside, but braked too late. It spun out, flipped over the hay bales, and skidded to a stop upside down.

The car was undamaged. No one was injured.

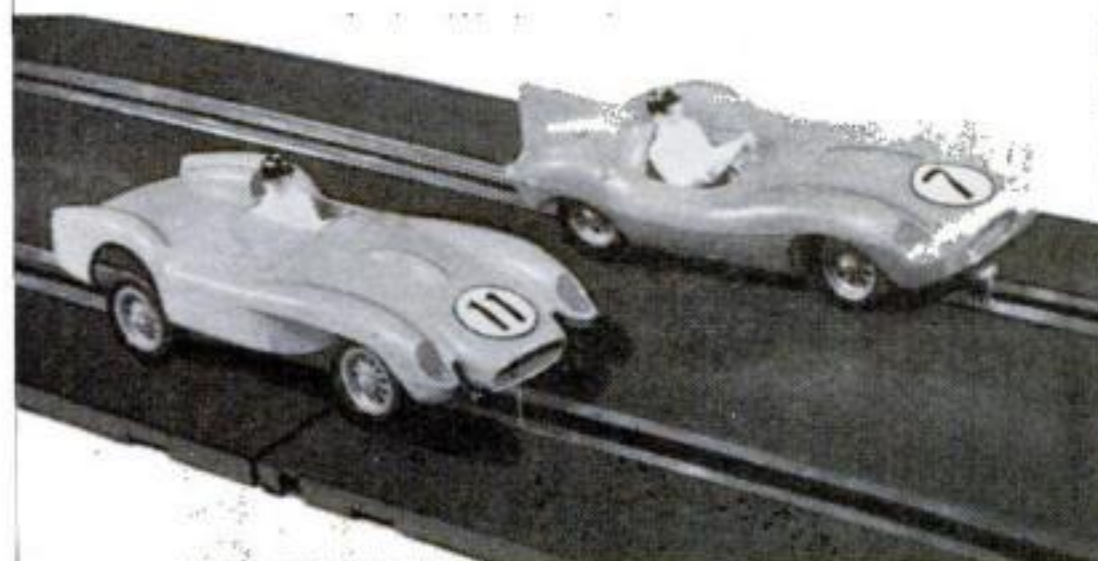
In fact, there hadn't even been a driver. The scene was a perfectly detailed miniature race track laid out atop a long table. The cars were tiny scale models, remote-controlled and electrically powered.

The fascinating hobby of model-car racing began in England less than five

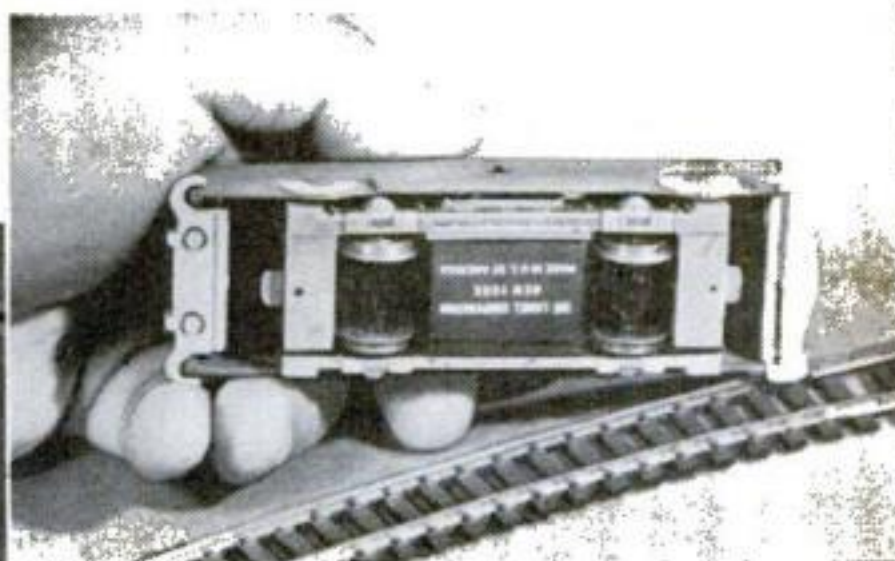


**LARGEST SCALE MODEL**, 7½-inch-long Mercedes-Benz 300SL coupe by Ideal Toy Corp., uses dual rails in place of the conventional roadway. Car is drifting as it rips into a banked turn. Embankments come with the \$40 set.

years ago. By no means intended just for children, it allowed the sports-car-conscious Britishers to enjoy the excitement of motor racing, complete with all the thrills and spills, but without the danger or expense. By 1959 the hobby had spread to this country. It's still snowballing today. According to Polk's



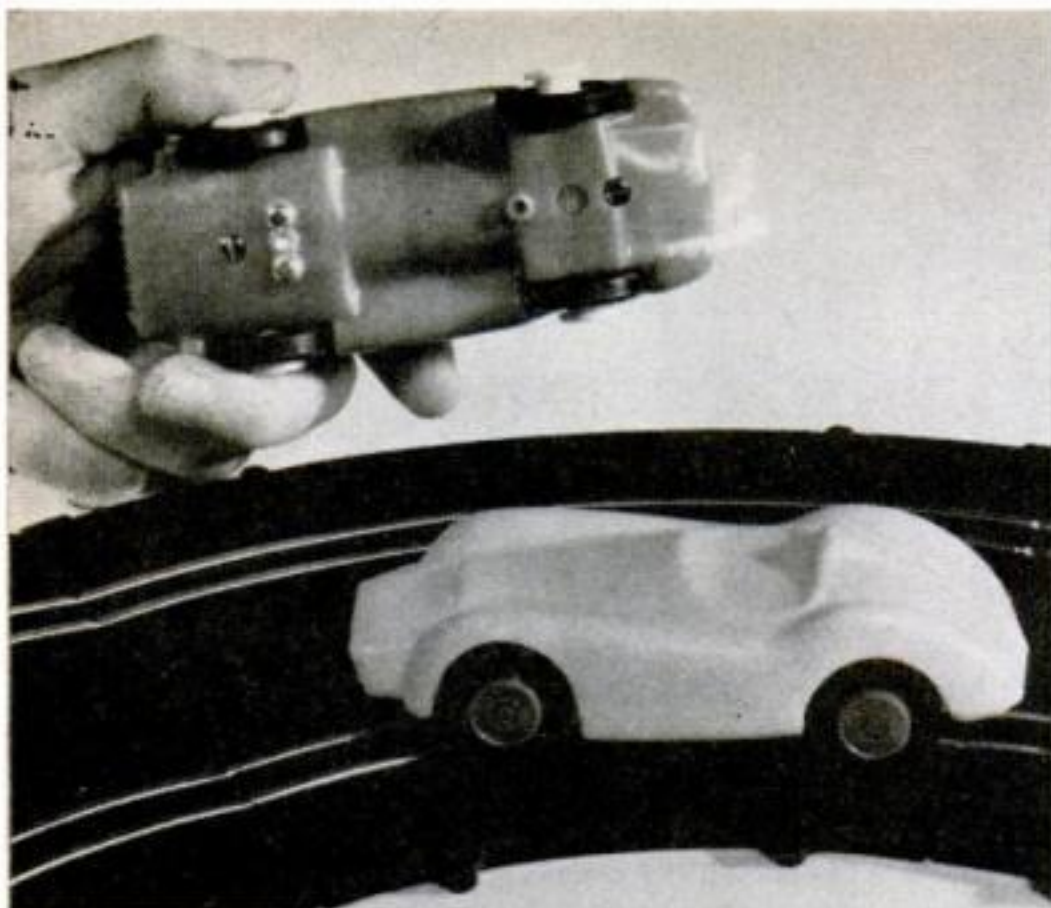
**JAGUAR AND FERRARI** made by Strombecker fight it out on a two-lane straightaway. The \$30 price tag includes overpass supports.



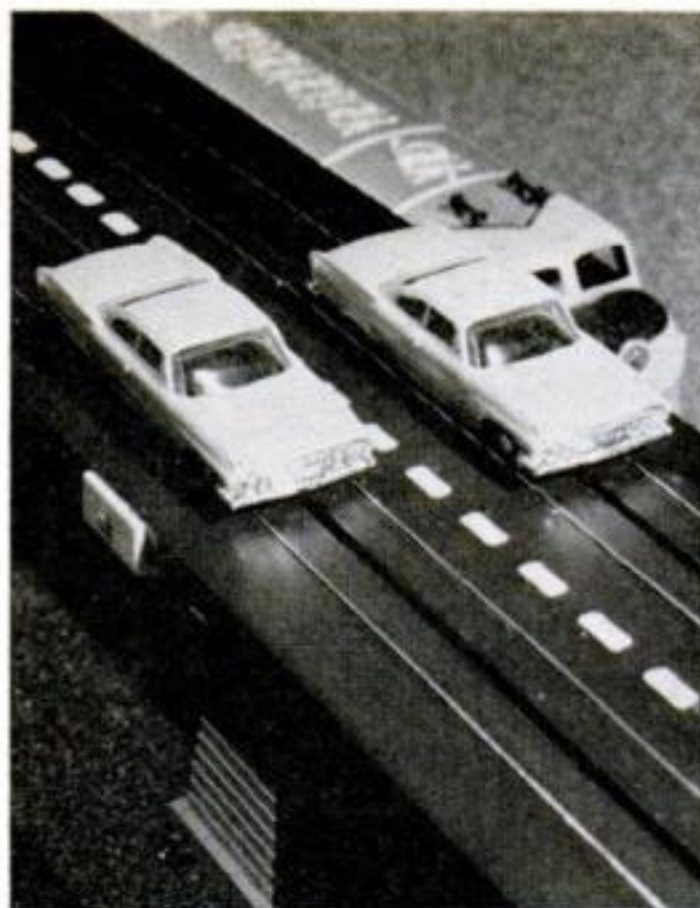
**RUNNING ON HO TRACK**, Lionel car can't drift through the turns, but it can flip if cornered too fast. The set sells for \$40 complete.

CONTINUED

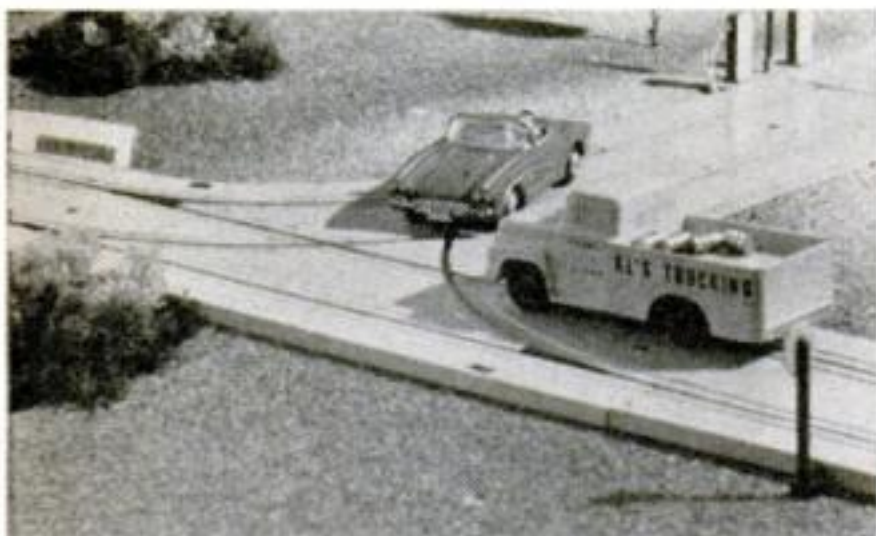




**RANGING IN PRICE** from \$10 to \$26, Eldon sets contain two Ferrari-type cars. Each car has two guide pins. Rear one can be removed if drifts and spinouts are desired. Low-cost set is battery-operated. The \$26 set comes with a transformer and a tiny "gold" cup for the winner.



**REALISTIC PYLONS AND TRESTLES** elevate the Aurora HO-scale highway system. Here two sedans are racing the train below. One basic chassis bolts to all the body styles.



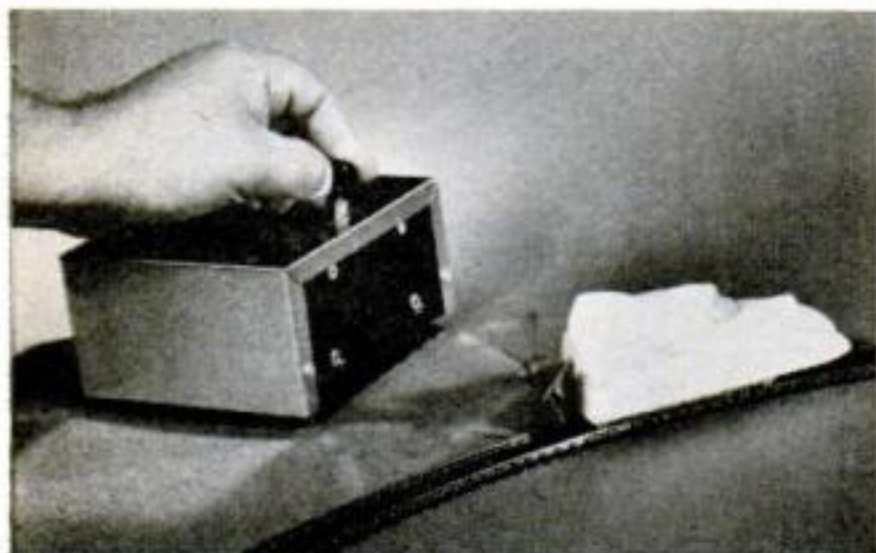
**CORVETTE AND TRUCK** approach switch-controlled T intersection in A. C. Gilbert highway system. Also available is a 1940 Ford stock-car racer. Sets cost from \$20 to \$40. Most expensive setup allows two cars to be independently controlled on a single lane. The cars can be run in forward or reverse, an exclusive feature.

Model Craft Hobbies, a big store in New York City that stocks all the available model-car sets, it may become as popular as model railroading.

*The typical setup* includes two or more cars and a two-lane roadway made up of straight and curved sections of rubber or plastic locked together. Two roadways placed alongside each other allow four cars to run at one time. Imbedded lengthwise in the roadway are thin metal contact strips—two for each lane—that carry current from a transformer.

Brushes under the cars pick up the current and deliver it to spark-gap motors. Some of these beautifully min-

*[Continued on page 194]*



**ATLAS VEHICLE** above, like Lionel cars, runs on HO track—but it is propeller-driven. Speed is controlled by pushing a lever on the power pack. A set, with two cars, is \$30.



**DIFFERENCE IN SIZE** of various manufacturers' models is readily seen with comparison of two-inch-long Aurora Corvette and the 3 1/2-times-longer Ideal 300SL "gull-wing" coupe.





**NINETEEN HOURS** from start to finish—that's how long it took a crew of 38 to construct this auditorium in Hawaii. The amazing dome can hold more than 2,000 people.



# Bucky Fuller's Wonderful Dome

***This bulbous structure is the hottest thing in the building business since indoor plumbing***

**By C. P. Gilmore**

**I**NDUSTRIALIST Henry J. Kaiser boarded the plane for Honolulu in a state of high excitement. He had just got word that workmen were beginning to construct the strange, dome-shaped build-

ing he had ordered for the auditorium of his new housing development, Hawaiian Village.

The controversial dome—brain child of mathematician-designer R. Buckminster Fuller—was unusual enough for Kaiser to want to be on hand personally while it was going up.

He was disappointed. When he landed in Honolulu several hours later, the building was already completed. Nineteen hours after construction began, the

CONTINUED

**BIG ENOUGH** to cover a football field, this tank-car repair plant in Wood River, Ill., is 380 feet in diameter. World's largest structure without interior supports, the all-steel dome was raised pneumatically by a huge air-inflated nylon bag as work progressed.





## Uniquely built from top down, domes make everything from



**THE BIG DOMES** go up fast, since most work is done at ground level. Workers bolt on a row



of preformed plates, lift dome a few feet with central mast, bolt on another row.

Honolulu Symphony Orchestra gave a formal, full-dress concert for an audience of 2,000 in the shining new structure.

That was in 1956. In the five years since, brothers, cousins, and stepchildren of the Honolulu model have sprouted by the thousands around the globe.

**Bubbles on the landscape.** Fuller's dome is the hottest thing to hit the building industry since inside plumbing. The bulbous buildings not only go up fast, but they're lighter, stronger, and often cheaper than conventional structures that provide comparable space. They come in any size and can be made of anything—plastic, wood, steel, you name it. And they're perfect for an almost endless variety of uses. For example:

- The DEW Line—our radar defense net across northern Canada—uses scores of fiber-glass domes to house its rotating antennas.

- A railroad roundhouse in Baton Rouge, La., and its twin in Wood River, Ill., occupy Fuller domes each big enough to cover a football field. Their 2½-acre floors are completely clear. Like all geodesics—the name Fuller has given his invention—they need no interior supports.

- The Marine Corps uses small ones as mobile military shelters. They're light enough to be carried by helicopter, and they're completely weatherproof. When no longer needed, they're cheap enough to abandon.

- The world's most unusual greenhouse, St. Louis' spectacular Climatron, contains millions of exotic plants from all over the world. The shell is an aluminum Fuller dome with a Plexiglas umbrella suspended inside.

- The golden dome of anodized aluminum erected to enclose the 1959 U. S. Exposition in Moscow impressed the Russians as much as all the exhibits inside put together. Khrushchev, so excited he forgot to claim a Russian had invented it, asked Fuller to come to Moscow and lecture to Soviet engineers.

Fuller's domes are causing an international stir for two reasons: 1) they're spectacular, and 2) they're probably the most efficient buildings ever built. They weigh only an ounce or two for each cubic foot they enclose, yet they shrug off stresses that flatten ordinary buildings.

A plastic dome built as a weather station atop New Hampshire's wind-battered Mt. Washington didn't even quiver in record 200-m.p.h. blasts. A dome used



**HURRICANE WINDS** can't budge it. This plastic weather station atop New Hampshire's 6,288-foot Mt. Washington doesn't even quiver in blasts officially recorded at 200 m.p.h.



## auditoriums to summer homes ▶

as a restaurant in Woods Hole, Mass., is made of Mylar sheet 3/1,000 inch thick stretched over a fir frame. It's as fragile-looking as a soap bubble, yet it weathered Hurricane Carol with only a few skin punctures.

Fuller, whose friends call him Bucky, hit on the central idea for his radical new structure when he realized that even today's most advanced buildings are heavy and inefficient. They use most of their strength just holding themselves up. Tension, the force that holds a bicycle wheel rigid, could hold up more weight with less material than could compression, reasoned Fuller. Yet compression has been used to hold up buildings ever since the first Stone Age man piled one rock on top of another.

Fuller started by designing aluminum houses strung from central masts by wires. Back as far as 1917 he had begun working out a completely new branch of mathematics, an extension of solid geometry which he named energetic synergetic geometry. Combining spatial relationships derived from his math with his theories about tension, the young inventor figured out a way to string together a series of tetrahedrons—three-sided pyramids—in such a way that tension struts are carefully balanced against compression members.

When Fuller built his theory into a dome, fantastic things began to happen. First a pattern of stresses developed; a strain on any part of the building was instantly transmitted through tension members to every other part. In other words, push on one part and the entire building pushes back. Since the building was composed largely of tension members—light, high-tensile-strength rods or wires—it could be extremely light, but just as strong as much heavier conventional buildings.

**Another strange twist:** The larger a Fuller dome is built, the stronger it becomes. The reason is mathematical. Double its size and you must square the number of strength-distributing parts. Since each supports and strengthens all the others, you add strength far faster than weight. Consequently, there's no limit to the size that domes can be built.

[Continued on page 184]



**1 HERE'S HOW** a 26-foot plywood building goes up. After the slab has been poured, pre-assembled triangular segments are unloaded.



**2 DOME IS ASSEMBLED** by bolting each triangle in place. Panel edges are color-coded; red matches up with red, blue with blue, etc.

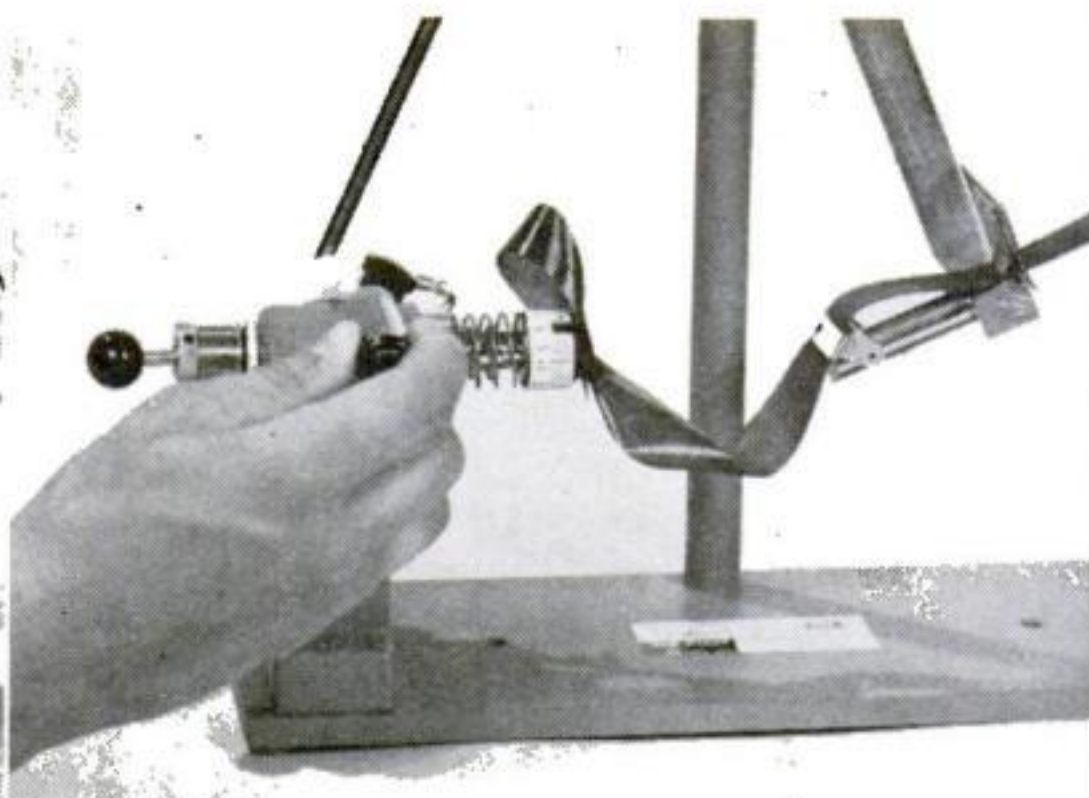
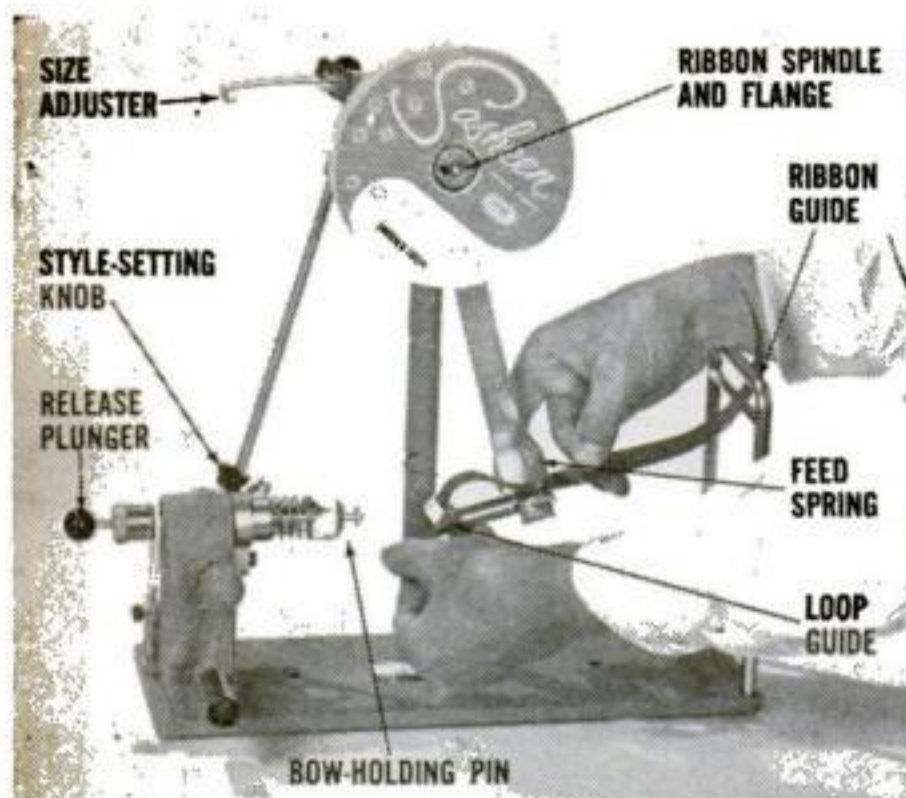


**3 PREASSEMBLED WINDOW, DOOR UNITS** slip into place to complete the job. Joints are calked, then covered with plastic tape.



**4 FINISHED DOME** makes a nice summer cottage. A larger, 39-foot dome with two bedrooms is roomy enough for year-round home.





1. Thread ribbon through guides in machine.

2. Attach end to pin and turn crank by hand.

## Machine that ties Christmas bows

Those fancy bows decorating store-wrapped Christmas gifts may not be handmade. They could be tied by machines such as the one shown here.

Thread the device with ribbon and adjust it for the type and size bow you want. Then wind the ribbon with a hand crank, snip one end of the ribbon with



## House high on rocky peak

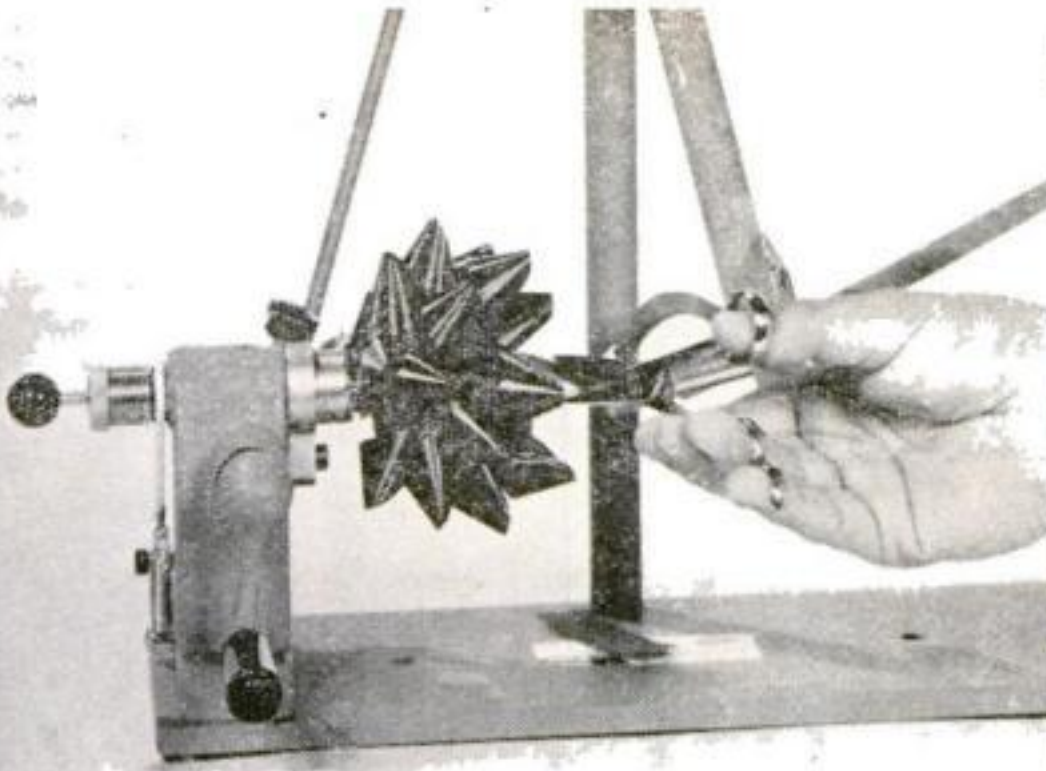
This seven-room house is perched like an eagle's nest 400 feet above Wyoming Valley, near Spring Green, Wis. It's built of rough timber and stone quarried nearby, and is lashed to the peak by 1,000 feet of steel cable. It's the home and studio of Alex Jordan, sculptor, who wanted to get away from it all.



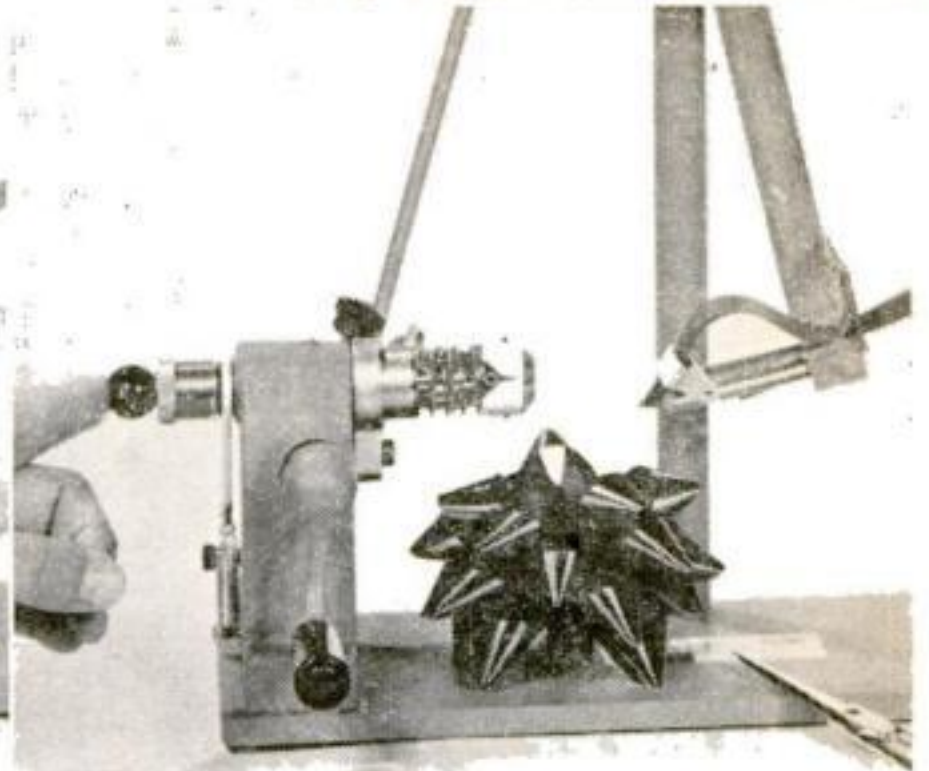
## Cantilever loading platform

The Army has come up with a new idea in pickups by helicopter from a moving ship. It's a movable platform that extends from the side of the ship like an ironing board attached to a wall. A shuttling copter can lift 2,000 pounds from the 24-foot loading dock in a minute without tangling in the ship's superstructure.





3. When tying is completed, snip off end.



4. Press release plunger; there's your bow.

scissors, release the other end by pressing a plunger, and the work's all done. The machine can be set for any of several different styles of bows and for diameters of two to six inches.

An experienced operator can tie as

many as 300 bows an hour, says Minnesota Mining and Manufacturing Co., maker of the S-71 Bow Maker. More than 12,000,000 bows were turned out on the machines last Christmas by two firms specializing in gift wrappings.

### Modern covered bridge

Arched Plexiglas encloses a new bridge spanning Court Place in Denver, Colo. A walkway from the second-floor lobby of the Denver-Hilton Hotel, at right, to the May-D & F department store across the street, the wall-to-wall carpeted bridge is also a sun deck for strollers, who may rest on marble-topped air-conditioning ducts along its sides.

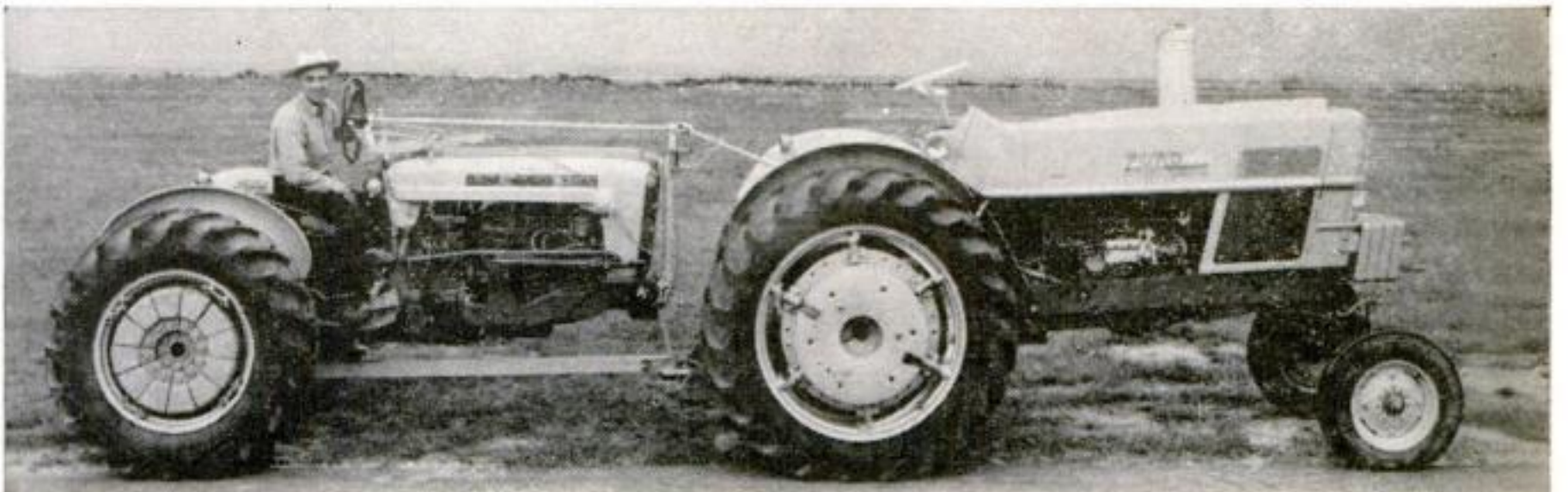


### Tandem tractors up power

The two Ford farm tractors hitched together in tandem below, produce a total of 100 hp. on four-wheel drive. Steering and transmission linkage between the

two tractors allows one man to drive the team from the rear machine.


For light work, the tractors can be unhitched and the front wheels remounted on the rear machine, allowing the tractors to be used separately.



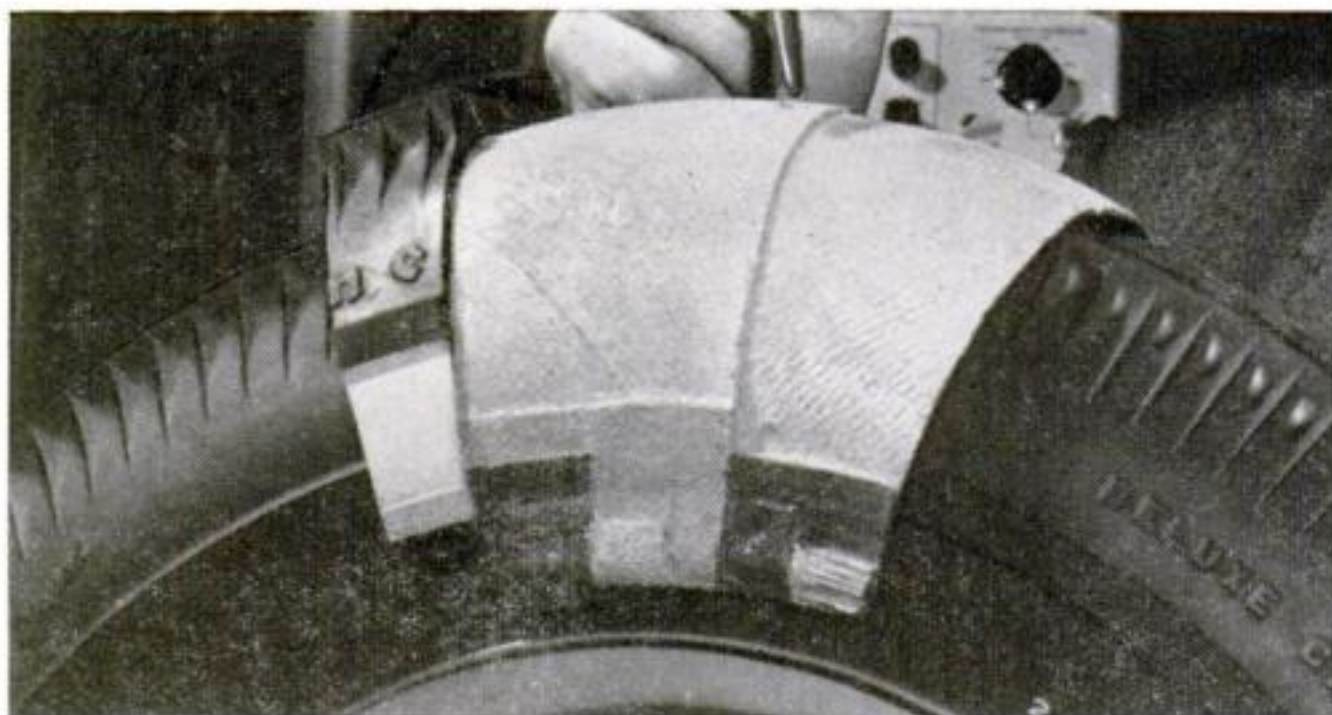


# What's New in Tires:

## Two Plies, Mixed Plies, New Plies, No Plies



**CROSS SECTION** of a two-ply tire, above, shows double-thick yarn, full tread depth that give new tires strength and wear qualities comparable to four-plys. Cross-lapping of fabric layers is shown in cut-away at right.



**By Robert Gorman**

**T**O LEARN what surprises the big tire companies have up their sleeves, I recently spent some days talking with the research engineers in Akron, the world's tire capital. Here's what they told me:

Two-plys are the big news for '62. They're original equipment on most compact and light cars. (Actually, some were sneak-previewed on a few '61s.) The change-over will soon be extended to the 800-by-14 tires used on many station wagons and medium-size cars. But tire men say there are no plans yet to put heavy cars on two-plys.

Also new this year is a unique mixed-ply replacement tire made with two inner layers of nylon and two

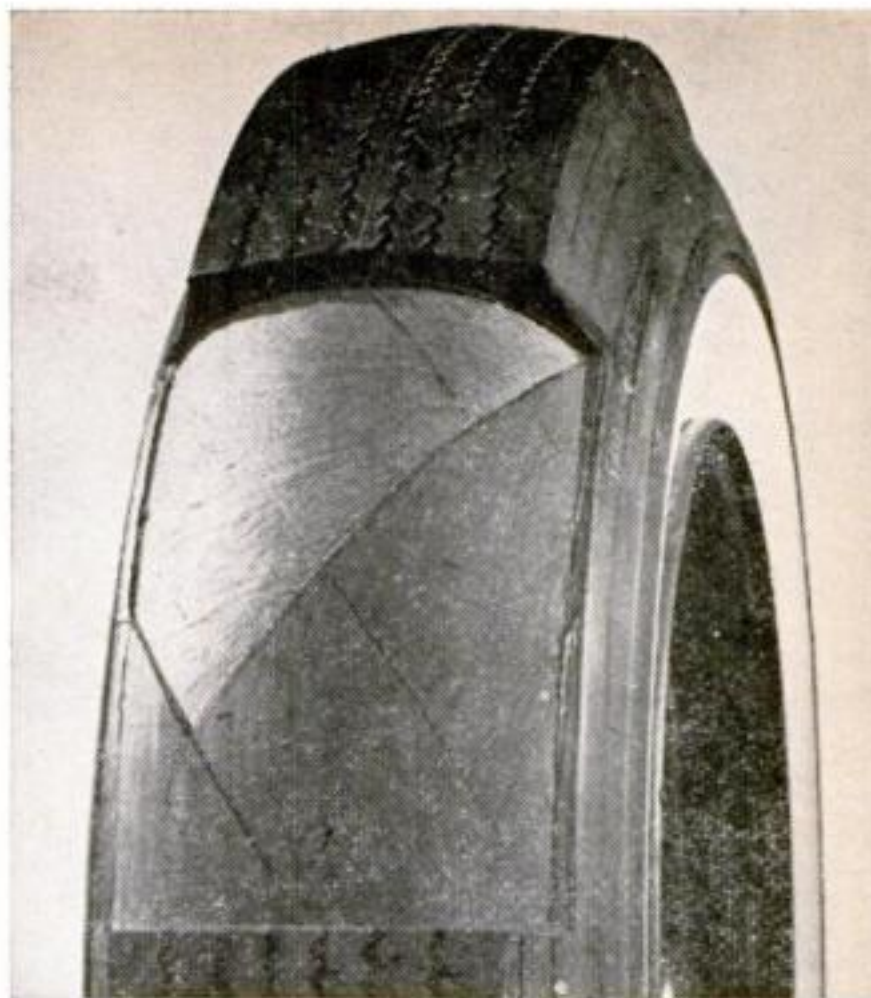


outer layers of rayon. The new Seiberling offering is said to combine rayon's quieter, thumpfree ride with nylon's greater strength and blowout resistance.

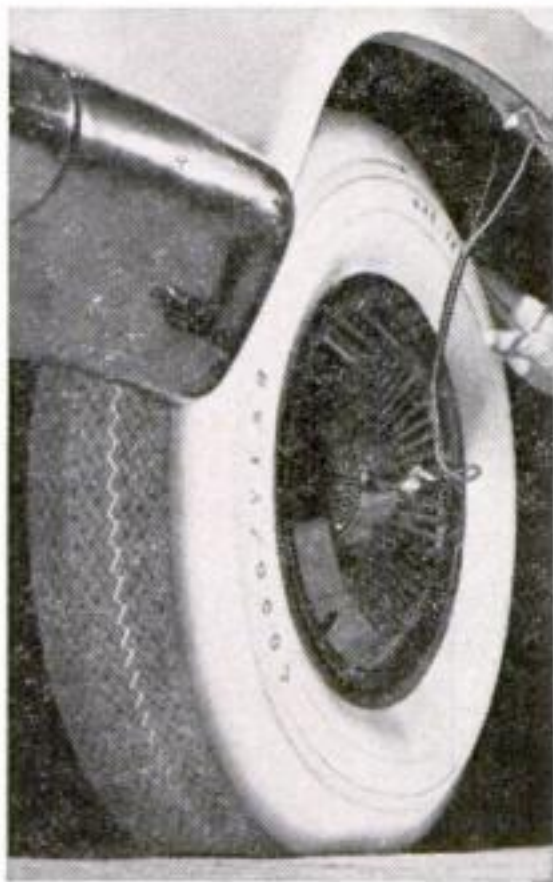
**New plies.** If present tests work out, next year may see premium replacement tires reinforced with Dacron or a similar polyester fiber. Though not yet as strong as nylon, the polyesters are well ahead of rayon. And they beat both rivals by a wide margin in heat-resistance.

Cost right now is the rub. If the price can be brought down, polyester fiber could leapfrog over nylon and win acceptance for original-equipment tires. The reason: Like rayon but unlike nylon, it doesn't "flat-spot," or thud after standing awhile. Up to now Detroit has been unwilling to demonstrate its new cars on tires that thump distressingly for the first five or six miles every time they begin to roll.

**Putting tires on a diet.** The main function of a tire is to contain the air on which you ride; for this, the less tire you have the better. Lighter and thinner



**MIXED-PLY TIRE**, recently introduced by Seiberling, has two outer layers of rayon for a quiet, thump-free ride. Most impact breaks start from within, so the tire's inner plies (lightly shaded, at top of cutaway) are made of higher-strength nylon—a happy compromise of safety, comfort.



**MOLDED TIRES** used on Good-year's demonstration cars are made of translucent polyurethane. To dramatize their no-ply construction, tiny bulbs mounted inside the tire are lighted through this revolving-contact rig, while a time exposure (right) photographs the car's trail. Main importance of the tire lies in its promise for automated manufacture of completely uniform, balanced, splice-free tires of the future.





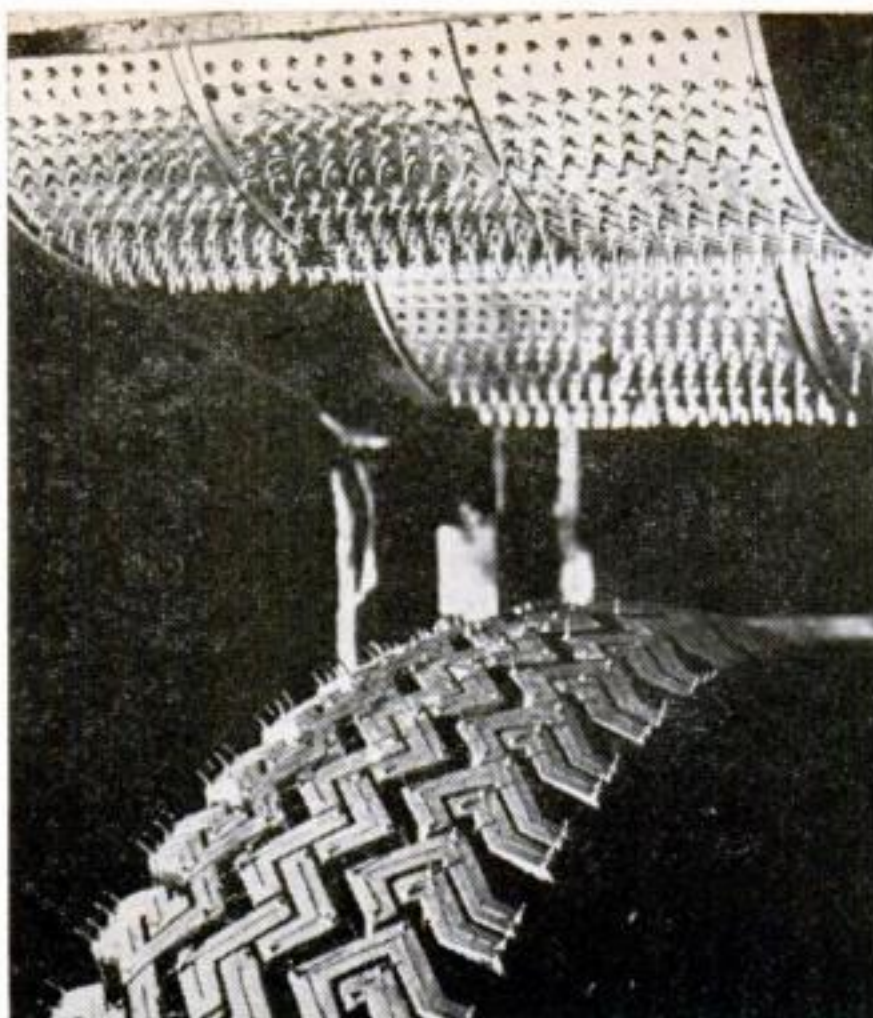


**INSIDE TREAD**, a new Firestone feature, results from an engraved curing bladder that helps funnel out any trapped air during cure and reduces the chance of molding defects.

tires run cooler, give you a better-cushioned ride, and improve car handling by reducing unsprung weight. Fewer plies help, since they generate less internal friction.



**FOUR-PIECE MOLDS**, in production at U.S. Rubber, are said to make tires more precisely round. Like new three-part molds, they could give tread designers greater freedom.



**TACK-STUDDED WHEELS** are used by Goodyear to "tractionize" snow tires, create a more flexible, crepe-like surface, and leave thousands of tiny, ground-gripping air holes.

All this, of course, has to be balanced against other requirements. You need enough strength to resist impact blow-outs, and enough stiffness to prevent excessive flexing, ply separation, tread throw-out, and other damaging effects. The obvious way to make better tires, therefore, is to use materials that give more strength with less weight.

The tire industry and its fabric suppliers have been upgrading cords in steady and unspectacular ways. A newly introduced rayon, for example, has 20 percent more tensile strength than last year's standard material. A recent and very expensive laboratory version of nylon overcomes flat-spotting without sacrificing any of its strength or heat resistance.

**Full circle.** Though two-ply tires are this year's main tire news, oldsters may wonder what's new about them. Two-ply cotton tires were standard equipment more than half a century ago and they held a major share of the market for over a decade.

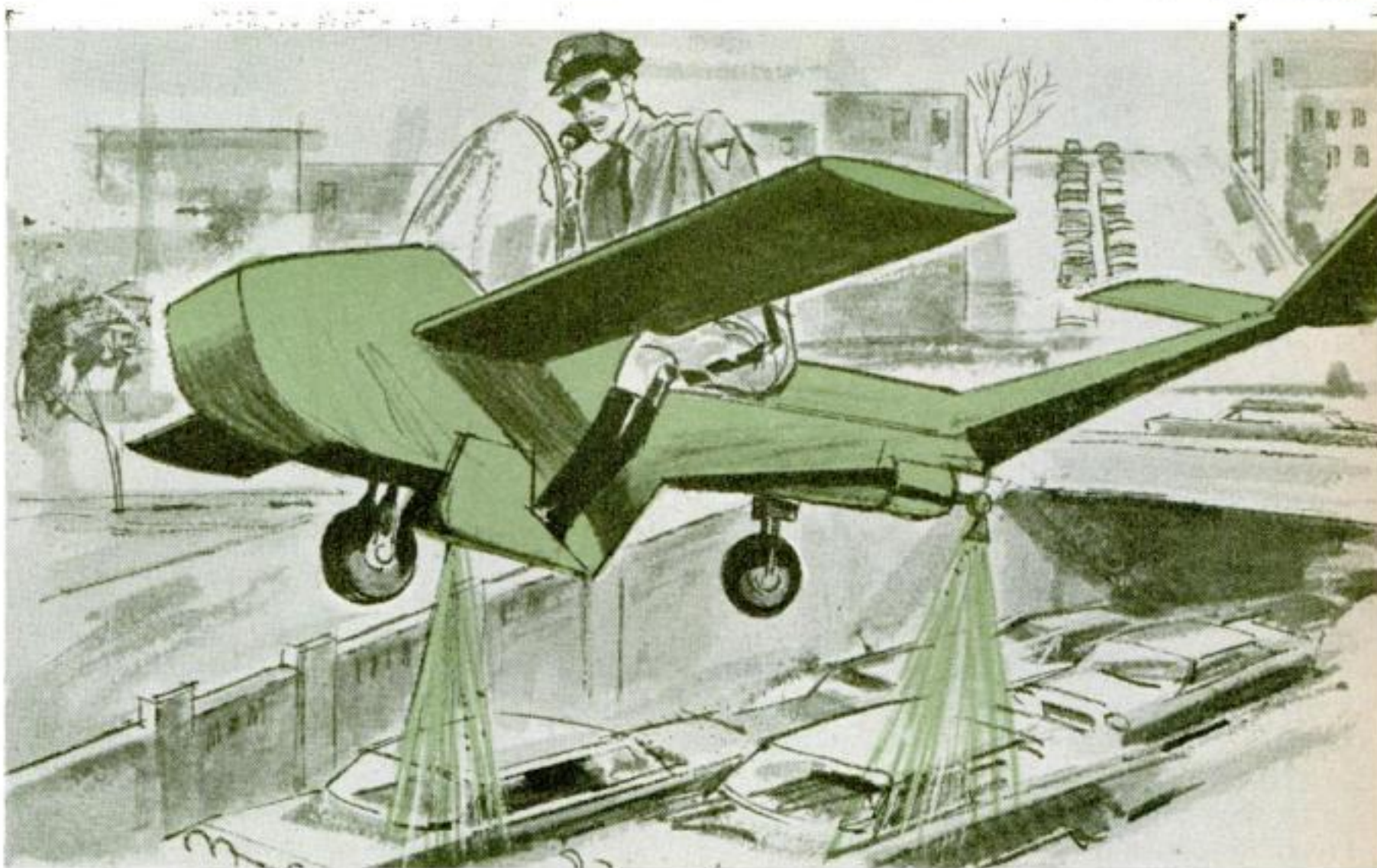
Then, cars steadily put on weight and passenger tires moved up to four, six, and more plies before the development of stronger fibers made it possible to reverse the trend.

[Continued on page 185]



# New Ideas from the Inventors

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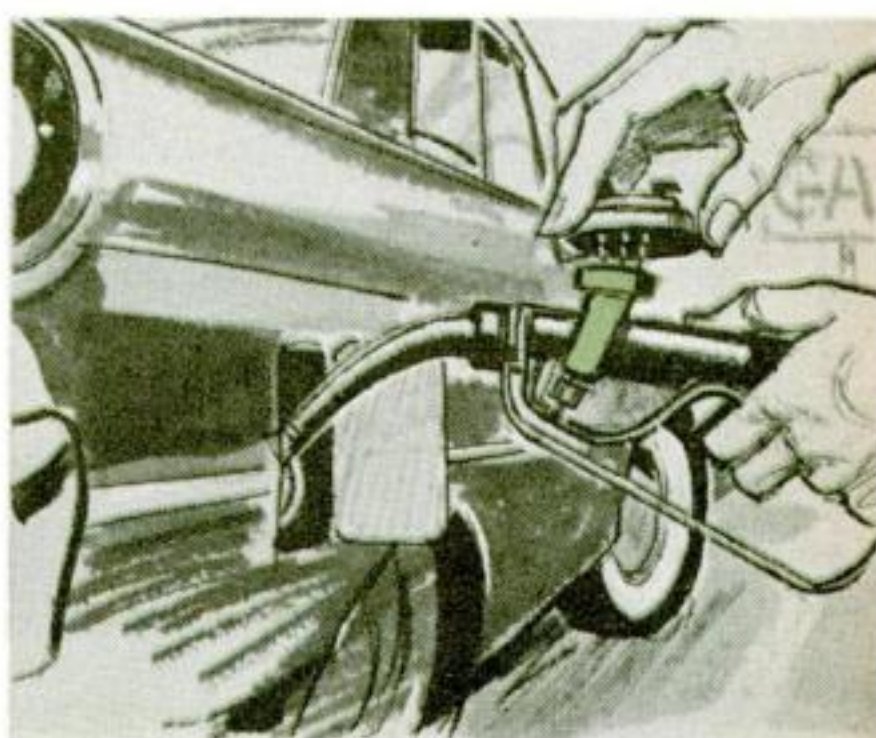
**Jet "Car" Jumps Traffic.** Driven by the exhaust of a hot-gas accumulator through adjustable jet nozzles, this one-man scooter would travel on the ground or

over it. Recently patented craft takes off vertically. It could give soldiers greater mobility, aid in emergencies, or help police in traffic spotting and control.

**Blanket Keeps Feet Warm.** If your feet get colder than the rest of you, this two-weight blanket might spare you the need—and bulk—of an extra cover. A band across the foot-covering area would be more tightly woven than the rest of the blanket to provide extra warmth where you need it most.



**Magnetic Hose Holds Gas Cap.** A service-station attendant couldn't mislay your gas-tank cap if the nozzle of his filler hose had this magnet insert. When he removes the cap he'd set it on the magnet; he couldn't help noticing and replacing the cap on your filler pipe before relatching the nozzle on the pump.







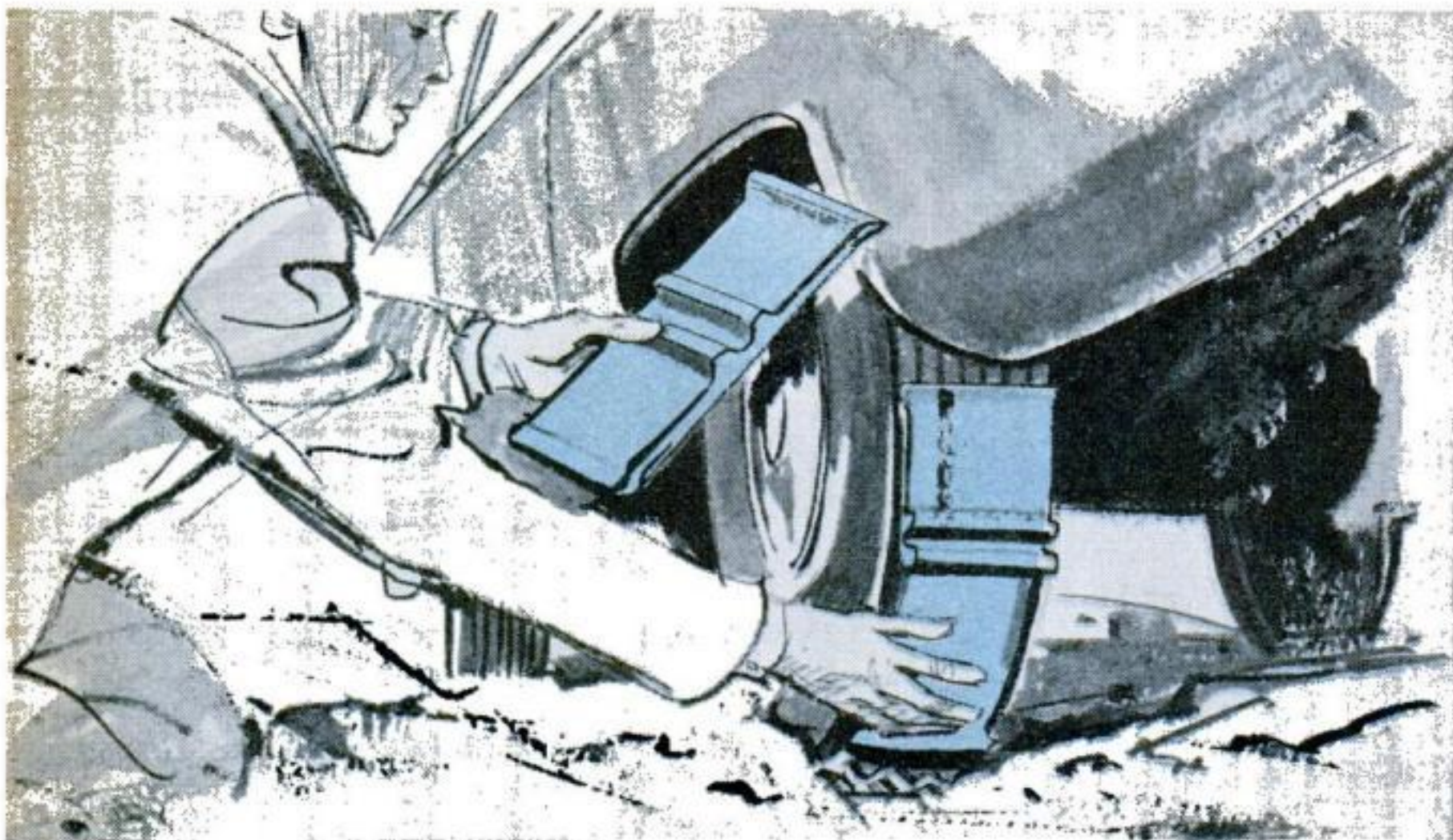
**Coaster Fits Chair Arm.** Drinks would be less likely to tip or spill if they were placed in glass holders such as these. Each holder would be attached to a clamp that could be held in the hand or placed over the arm of a chair. A spring and latch would let you adjust the telescoping clamp to fit any width chair arm.



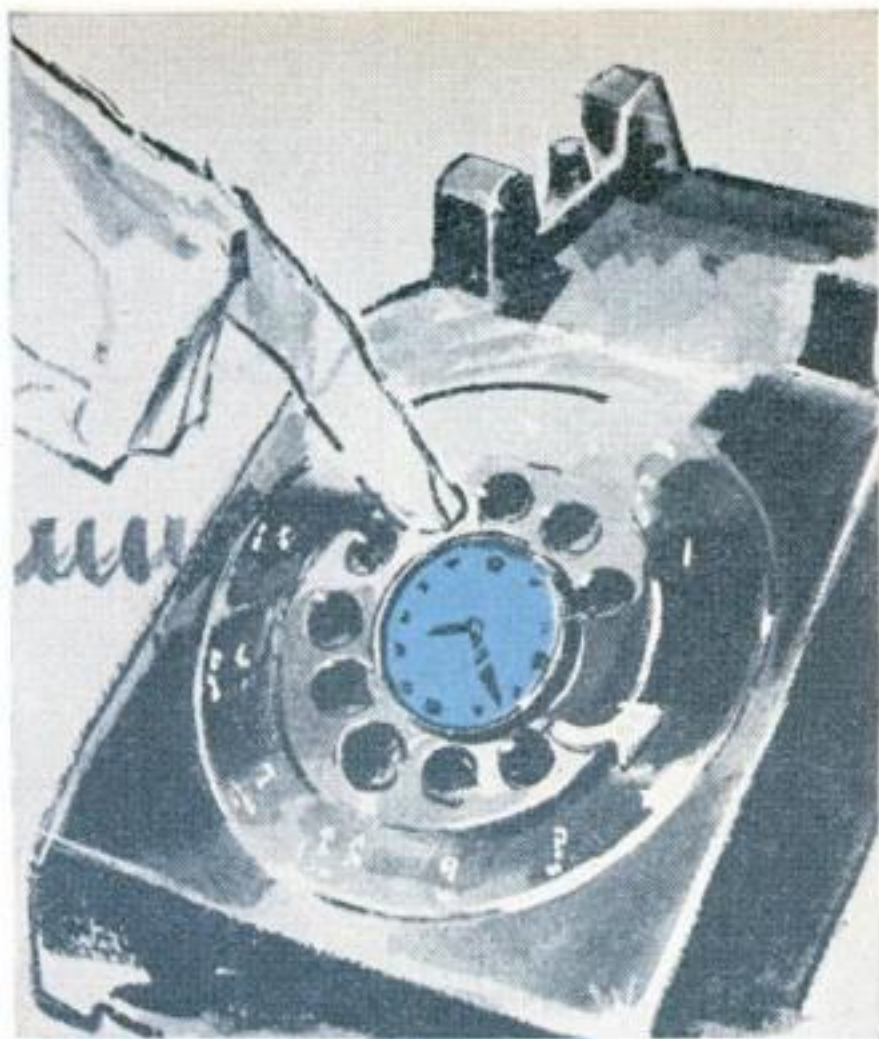
**Razor Guide Evens Sideburns.** You'd have less trouble shaving your sideburns straight and to the same length with an electric or safety razor if you used this tapered guide. Held against each ear with two finger holes, it would limit the razor's cutting line and thus would assure you a uniform, straggle-free trim.

**Tire Patch Grips Snow.** Instead of struggling with jacks and chains to get temporary extra traction, you'd cement these patches to your tires. Two would be

mounted on each wheel, 180 degrees apart. The molded cleats would dig into snow or mud, providing traction. Once free, you'd peel off the patch for re-use.







**Dial Winds Phone Watch.** Clipped into the phone dial that normally holds a number plate, this watch could aid you in making phone appointments and might help you hold down the time—and cost—of your calls. Dialing the phone would automatically wind the watch—which is stationary while dial turns.

**Cup Cools and Warms Coffee.** This three-part cup would quickly bring your coffee to drinkable temperature, then keep it from overcooling. Concealed fins radiate the coffee's heat into a wax-filled chamber enclosed by an insulating outer shell. When the wax melts (at about 147 degrees), it would start giving back some heat to keep the coffee warm.



**Tandem Skis Help Beginners.** A novice could learn to ski faster, better, and more safely, says this inventor, if the instructor could ride along instead of trying to demonstrate the art from a distance. The skis-for-two would be longer, thicker, and more cambered than usual, and would have tandem bindings.

*The following patents have been issued on these inventions:* **Jet scooter**—No. 2,989,271 to A. Bohr, Sparta, N. J.; **Blanket**—No. 2,986,173 to W. Johnson Jr., Asheville, N. C.; **Cap magnet**—No. 2,982,318 to T. Ferreri, Reading, Pa.; **Coaster**—No. 2,879,023 to F. Barrier and G. Schklair, Brooklyn; **Razor guide**—No. 2,879,778 to R. Peck, Independence, Kans.; **Tire patch**—No. 2,850,068 to R. Clifton, Cincinnati; **Dial watch**—No. 2,876,617 to W. Canning, North Woodbury, and N. Slater, Waterbury, Conn.; **Cup**—No. 2,876,634 to H. Zimmerman, Mountain View, and J. Welsh, Santa Clara, Calif.; **Skis**—No. 2,984,497 to G. Hagen, NYC.

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D. C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.





Radio-controlled target looks human in the field; simulates movements of an enemy . . .

## Mobile target acts like a man

A movable figure on this three-wheeled Army target trains sharpshooters by performing like an enemy in the field. Controlled by radio, it runs erect, crouches, or crawls, moving forward at one of four

speeds: 1½, 3, 6, or 10 m.p.h. It retreats at up to 6 m.p.h.

The 6-foot, 6-inch target is rigged to detect hits and radio them back to a controller. If a bullet strikes a "vital



## Compact fire-fighting cart

Latest model for fighting fires inside industrial plants and on their grounds is this Taylor Dunn three-wheeler. The tiny fire engine scoots around with chemicals up front, water hose in back, ladders on top, and a crew of three: one next to driver, the third on a rear platform.



## Golf on the high seas

A line attached to a golf ball was used instead of the customary gun for ship-to-ship transfer of mail off North Carolina.

Lt. R. B. Prell teed off on the USS Talbot County with a No. 2 wood and hit her sister ship, scoring a hole in one.





... running ...



... crouching ...

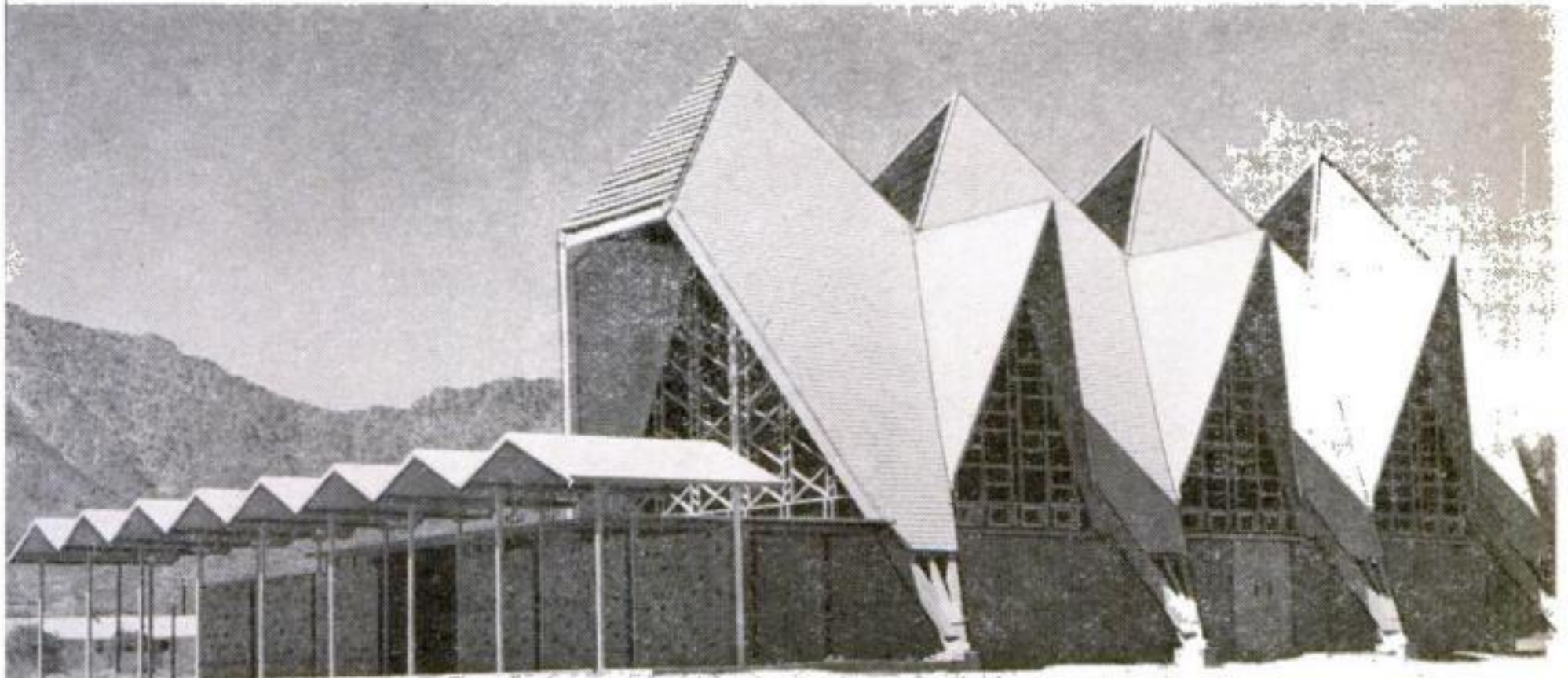


... crawling.

spot," it collapses, and an electric motor powering its armor-plated carriage stops. The figure, of styrofoam and paper, can absorb 500 hits before replacement.

One reason for development of the new target was to help forestall the unnerving excitement that seizes young soldiers the

first time they go into actual combat. It was designed by Aircraft Armaments, Inc., Cockeysville, Md., built at the Naval Training Device Center at Port Washington, N.Y., and is now undergoing extensive testing at the Army Infantry School at Fort Benning, Ga.



### Four-steepled church

Multiple steeples adorning the Prince of Peace Lutheran Church in Phoenix, Ariz., are actually tall gables. They are formed of diamond-shaped trusses designed by architect Edward Davis, Pasa-

dena, Calif., to achieve the mood and appearance of a cathedral.

The structure is built of heavy timbers and simple block walls. It has a 2,400-square-foot sanctuary that can seat 200 worshipers and a 1,000-square-foot Sunday-school and office wing.



# The Story of Sam Colt's Equalizer

By Gardner Soule

**S**OME men are big, some small, but Sam Colt made them all equal," frontiersmen out West used to say. This process of making men equal began 125 years ago, in 1836, when Andrew Jackson signed the first U.S. patent the then-unknown, 21-year-old Samuel Colt ever received. Most hand guns at the time—such as horse pistols and derringers—fired a single ball. Colt's basic patent covered a pistol with an automatically revolving cylinder that contained five balls, and would fire five times in rapid succession between loadings. (Six-shooters were a later improved version.)

The first men to be equalized by the Colt revolver were Texans and other

westerners—and the Plains Indians. In 1836, Americans were fighting, right here on this continent, an enemy superior to them in weapons. The bow and arrow was the best weapon in the West, and the mounted Plains Indian knew how to use it. In one minute, he'd fire 20 to 30 arrows at a frontiersman, meanwhile galloping 300 yards toward him on horseback. He could keep an arrow constantly in the air between himself and his enemy. Once he reached the frontiersman, he'd finish the job with his spear. Pioneers called the body of someone caught by a Plains Indian a "pin cushion."

In that minute as arrow after arrow snapped down upon him, the frontiersman had time to ram one bullet down the barrel of his 44-inch long rifle and fire

## Fireworks at school

1. Born July 19, 1814, in Hartford, Conn., Samuel Colt lost his mother at seven. Packed off to Amherst Academy, he faced an early struggle: He was unpopular with the boys because he could not run, jump, or kick an inflated pig bladder with skill. At 15, he sought and won their regard with homemade fireworks. But on July 4 he set a school building on fire. This made him unpopular with the faculty. He was packed off again—this time to sea.



## Ship's wheel gives Sam an idea

2. On the Corlo, a brig, Sam sailed all the way to Calcutta. At cracker-barrel sessions he'd heard, from veterans of the Revolution, of great deeds with double-barreled rifles. On the long voyage, Sam had plenty of time to watch ship's helm. As the wheel turned, he saw each spoke came into line with a clutch that held it. This was the idea that produced the Colt revolver. On shipboard, at 16, Sam whittled out a wooden model.





### **The Peacemaker Colt**

Introduced in 1873, this was perhaps the most famous of all Colts. A .45-caliber six-shooter designed for the Army and used by everyone in the West, it was the first large revolver for self-exploding metallic cartridges. Most previous Colts had been cap-and-ball pistols. Barrel length varied from 4¾ inches (civilian model) to 5½ inches (artillery) to 7½ inches (cavalry) to 12 inches for Wyatt Earp, who claimed the long barrel did not slow up his draw.

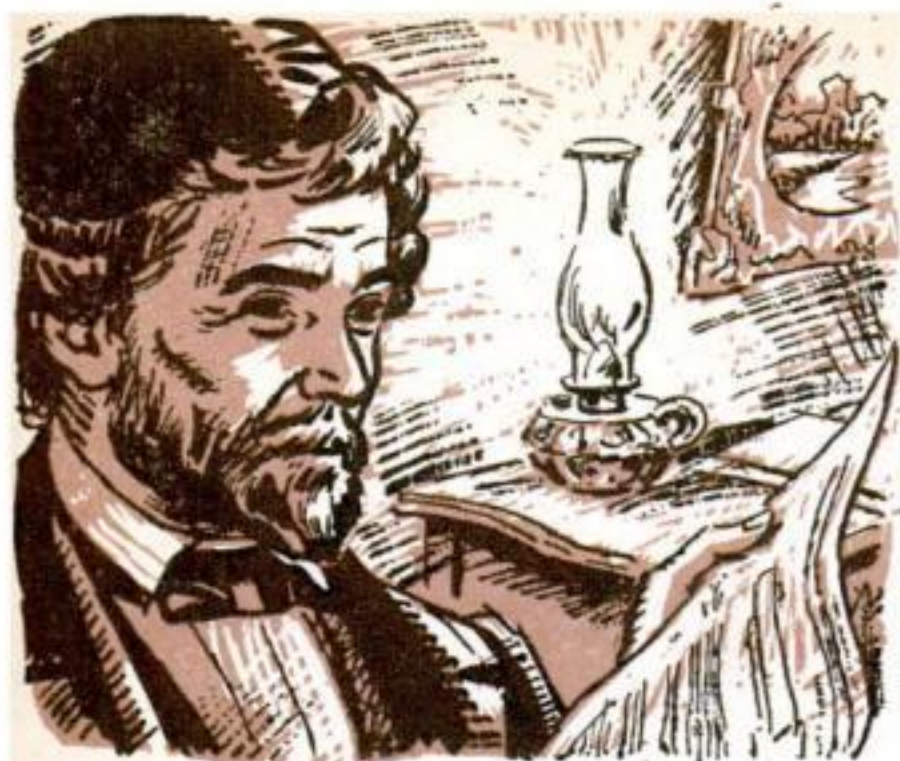
### **"It won't work"**

3. Home after one trip, Sam wanted to stop seafaring. Asked his father, "Have you brought home a fortune, that you are so ready to quit the sea?" Sam answered "Yes," demonstrated his wooden gun. Dad had professional gunsmiths make a couple. One burst on firing. The other never fired at all. Sam recognized the trouble: Lack of precision in the parts. But gunsmiths said revolver never would work. Dad advised Sam to forget about it.

Disappointed, Sam, 18, quit home to "paddle his own canoe." To raise money to back his revolver, he tried lecturing on the recently discovered nitrous oxide (laughing gas). With effort, Sam grew a beard, billed himself as "Dr. Coult of New York, London, and Calcutta." He got audiences laughing from Boston to New Orleans. But he couldn't make enough money, and was reduced to returning home and sponging \$800 off his father.







### **A night in history**

4. On February 25, 1836, Sam sat in a hotel room in Washington and looked at his new patent. In Texas, the Mexican Army was besieging the Alamo. Vastly outnumbered and poorly armed, the defenders all died. Later, Texas and Colt would rescue each other.

Colt opened a factory in Paterson, N.J., produced his first crude guns. Each chamber had to be loaded with powder and ball like a muzzle-loading rifle. Nobody wanted them.

one shot back. Or, if the Indians attacked when he had ready a loaded gun plus a loaded single-shot pistol or two, he might even get in two or three shots.

But this was not all that was wrong. The bow and arrow were ideal for use on horseback. The Indian so armed could move, attack, or pursue at will. The long



### **Found: a good customer**

5. In New York City one day, Colt met a stranger buying piles of his unsold guns at cut rates. The man was Sam Walker, Texas Ranger captain. The meeting of these two men, unsung by history books, led to the conquest of the West: Walker suggested improvements—heavier frame, better grip, simpler reloading (for horsemen). Colt added them. Resulting .44-caliber weapon, named Walker, was a much better gun for use on the frontier.

rifle was designed for a man on the ground. The pioneers climbed down off their horses to fight the Indians, had no freedom of movement whatever, and had to remain always on the defensive.

Colt—a slender, hazel-eyed six-footer with short curls—invented a revolver that changed this situation on the frontier and,



### **Success at last**

7. Colt hadn't a single revolver left. He redesigned the Walker model from memory. Eli Whitney Jr., son of the cotton-gin inventor, manufactured it. Texas Rangers, as spies and scouts, used Colts to such good advantage that both Rangers and Colts became known around the world. The entire U.S. Army clamored for Colts. The Army used them to win later Indian wars, received 387,017 for the Civil War. Southerners copied Colts, made their own revolvers.



### **How Colts stopped a stampede**

8. Texas discovered another use for the Colt revolver: Cowboys found them handy to protect cattle on the drives from Texas to Kansas. In a stampede, the cowboys would fire across the cows' faces, turn the herd into





### Comanches get a surprise

6. Poverty-stricken Texas could buy only a few Colts. Sam finally had to close his factory. Then Texas proved worth of his gun. On June 8, 1844, at Battle of Pedernales, 80 mounted Comanche Indians charged Sam Walker and 15 other Rangers. The Indians expected the Rangers to dismount. But Rangers at last had weapons they could fire fast and accurately on horseback—Walker Colts. They startled the Comanches by chasing them, killed 33.

In 1846, war came between U.S. and Mexico. An American, Captain Thornton, had his outfit wiped out. Only Thornton himself, with two Colt six-shooters, shot his way to safety. Two Colts each were ordered for 500 Texas Rangers.

so doing, changed the history of the West and of the U.S. as well. "The story of Colt's invention, his struggle, his confessed failure, and final success," Walter Prescott Webb, historian of the Great Plains, has written, "is a story which for dramatic interest is perhaps not exceeded in the annals of American invention."



a milling mass, and end the stampede. Pinned beneath his horse and charged by a longhorn, one cowboy calmly pulled his Colt, shot the steer dead. But, TV to the contrary, few cowboys ever became really crack shots. They could not afford the ammunition—at least 10 rounds a day—necessary for target practice.



### End of trail for Colt

9. Colt died, at 48, on January 10, 1862, in Hartford. The demand for his guns had caused the development of methods of mass production of revolvers a generation ahead of other industries—thus showing the way for today's mass production of almost everything. That in itself was an achievement, but not Colt's basic one. He found the pistol a single-shot gun. He left it a six-shooter. That made it, for the first time, an effective weapon.





## Pedals Push Toy Fork Lift

Pull on the lever at the front of this junior-size industrial machine, and you can lift a sizable load, or it will tilt the blade so a youngster can use it as a toy bulldozer or snow plow.

The vehicle is propelled by pedals working on the front axle. It's steered by the two small rear wheels controlled by "joy sticks" at the sides.

Gym-Dandy Lif-Tup frame is steel tubing; scoop, sheet steel; and seat, tough Marlex plastic. \$29.95. Universal Mfg. Co., 415 Hamilton Rd., Bossier City, La.



**RADIO CONTROL** for powered balsa model planes consists of transistorized transmitter, receiver that fits in plane, and aerials for both. Control is by push-button signals that move rudder. Price, \$69.98. Wen-Mac Corp., 11511 Tennessee Ave., Los Angeles.



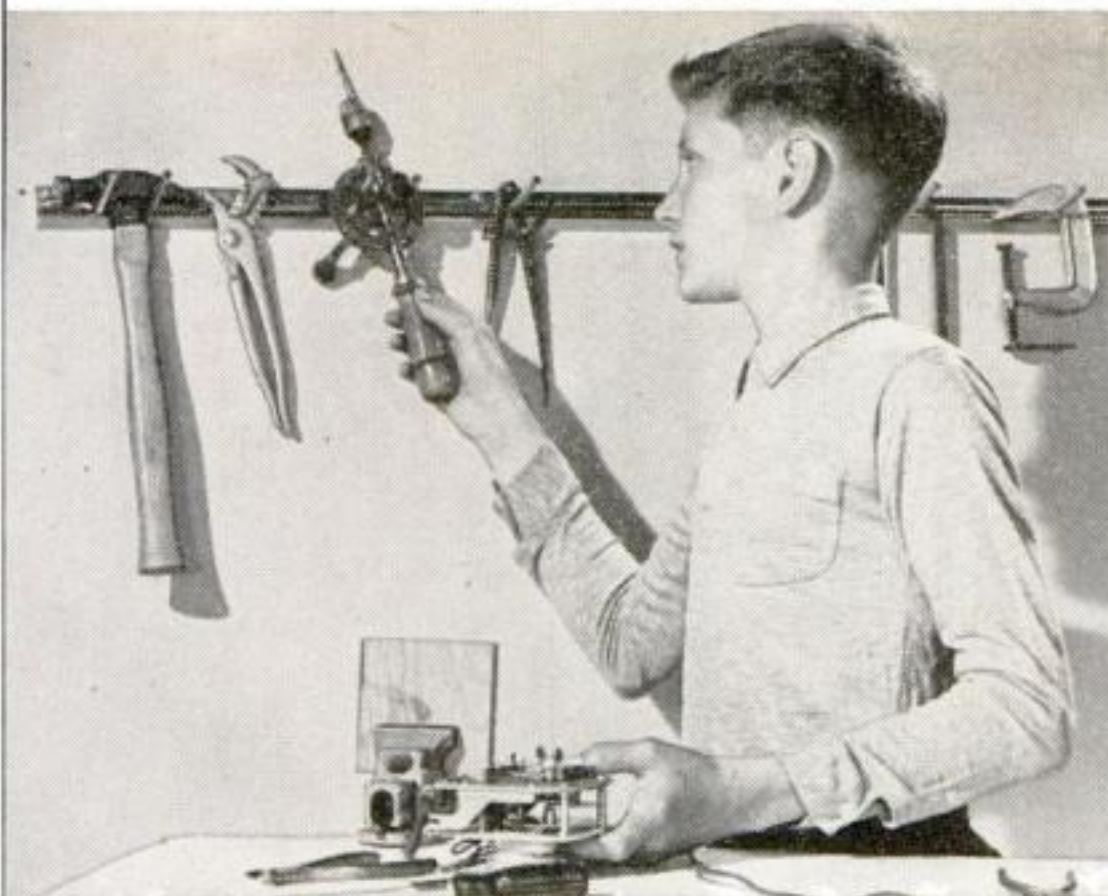
**TWIST CALKER** does away with need for regular calking gun. Compound comes in cartridge that has ring at base. Turn ring to right and compound flows out; a half-twist left, and you stop it. Flo-Gun, 98 cents. Masco Products, 1511 W. 38 St., Chicago.



**INTERCOM KIT** contains all tools and parts needed to build master and remote stations, plus manual of detailed instructions. It's one of seven new educational projects selling for \$9.95 to \$39.95. Intercom kit costs \$24.95. General Electric, Utica, N.Y.



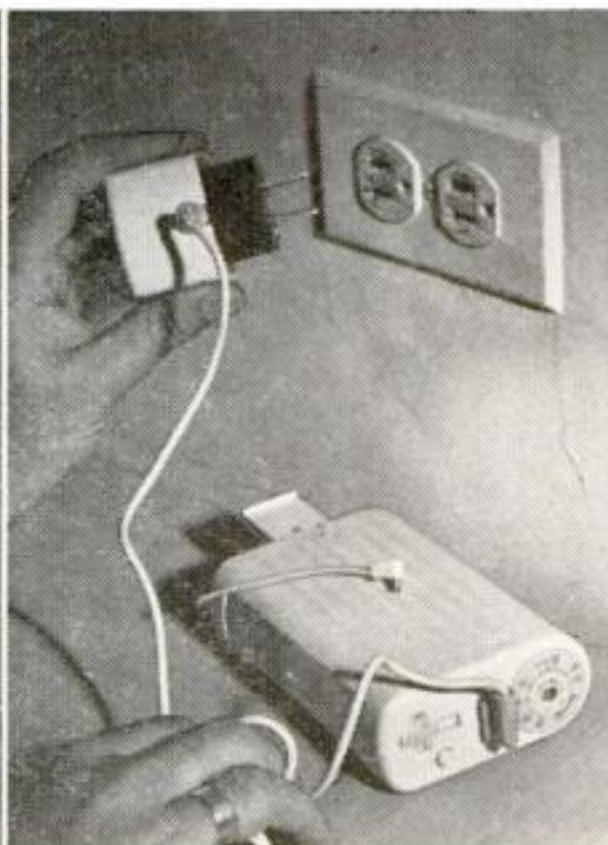
# .....WHAT'S NEW for Christmas



**TOOL RACK** is 4 feet of 1½-inch aluminum track and 8 aluminum pegs 3 inches long. Rail has predrilled holes for screwing to wall on 16- or 24-inch centers. You slide pegs in track for desired spacing. Natural aluminum, \$2.95; gold anodized, \$3.95. Macklanburg-Duncan Co., Box 1197, Oklahoma City.



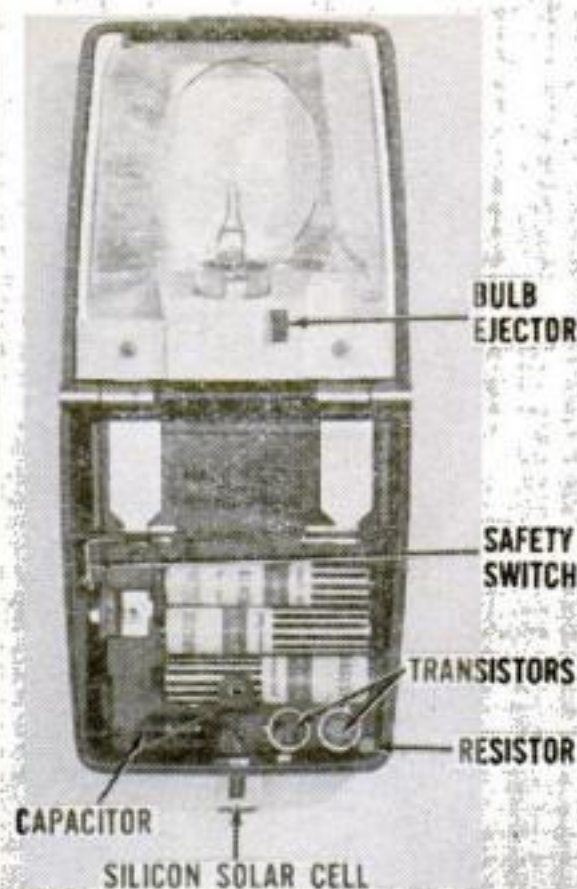
**BUILT-IN FLASH** automatically sets shutter of Kodak Brownie Super 27 for correct flash speed when you open lid. It's at nonflash, outdoor-exposure speed when lid is closed. Segmented reflector gives light coverage of larger unit. With roll of film and four bulbs, \$19. Eastman Kodak Co., Rochester, N.Y.



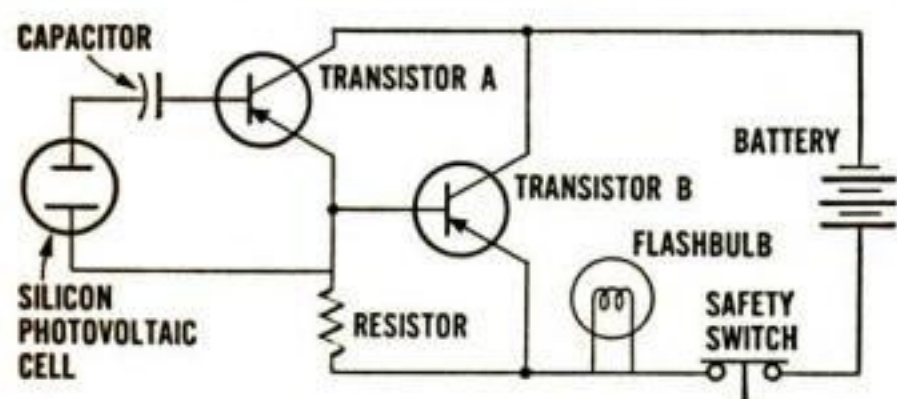
**ELECTRONIC FLASH** ends the need to change bulbs and batteries. Two imported units make it cheap enough for amateurs. Each is transistorized and self-contained, powered by a nickel-cadmium battery that recharges from household current. Both have a 40-watt-second input, color guide number in 30-35 range for ASA 10, recycling time averaging 10 seconds, audible and visual ready signals,

and mounting foot that fits shoe of any synchronized camera. (Accessory bracket is needed for shoeless cameras.) German unit (Ultrablitz Monojet SP, left and center) is \$74.95. Allied Impex Corp., 300 Park Ave. S., NYC. Belgian unit (X-100, right) is heavier, claims more flashes per charge, and sells for \$69.95. Photronic Corp. of America, 6478 Sligo Mill Rd., Washington, D.C.





## Slave Flash Needs No Cord



Photocell triggers remote flash when camera's flash gun goes off. Pocket-size two-transistor unit takes midget or regular bulb, fires when electric eye "sees" light from camera—up to 50 feet away and without time lag. You can hold it or mount it on tripod or table. \$20. Eastman Kodak Co., Rochester, N.Y.



**ROCKET-ARMED PLANE** fires missiles while flying when a control cord on the "stick" triggers them from under wing. Glow-plug motor of cannon-nosed Bell P-39 Airacobra starts when you spin propeller. Two-foot wing-span scale model has removable engine cowl, hinged cockpit canopy, and flashing navigation light. \$9.98. Wen-Mac Corp., 11511 Tennessee Ave., Los Angeles.



**DO-IT-YOURSELF VIOLIN** is a plastic fiddle that comes in a kit containing 22 parts. You or your youngster can put it together in about five hours, the manufacturers say, and have an instrument that will make music depending upon your own ability and technique. It sells for \$5.95 unassembled, \$9.95 ready to play. Paramount Distributors, Inc., 3040 Webster Ave., NYC.



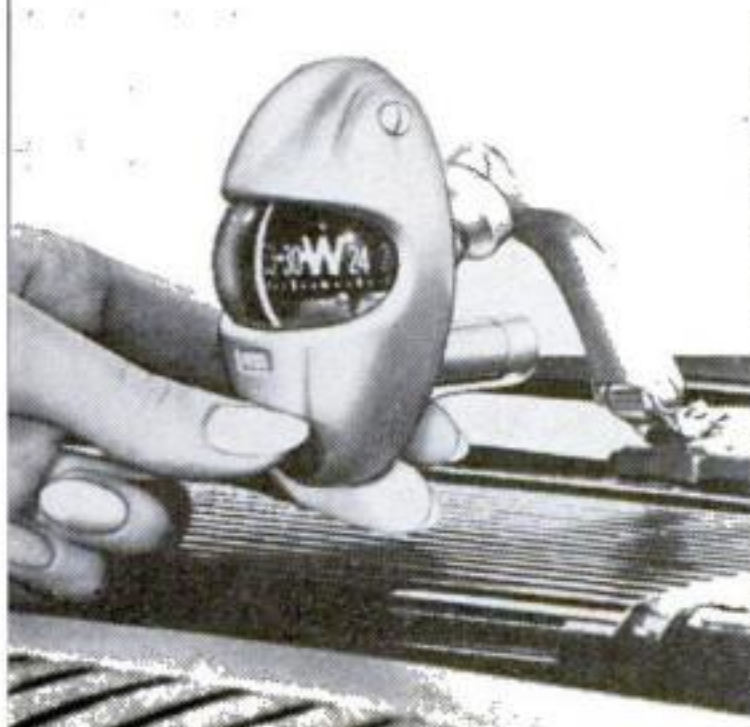
# .....WHAT'S NEW for Christmas



**ELECTRIC WRISTWATCH** runs on battery the size of an aspirin tablet. You can replace it yourself when it's spent after about a year of use. Simply pry off lid of container in case and put in new battery that costs \$1. Watch has jeweled movement, is waterproof, dust-proof, and shock resistant. It's priced at \$39.95 complete by its manufacturer, U.S. Time Corp., 375 Park Ave., NYC.



**MODEL-A PHAETON** has removable hood that exposes detailed Ford engine. It's assembled from kit containing interlocking metal parts, movable gear-shift lever, working steering mechanism, rubber hose and rotating fan, plastic seats, and top you can take off. Others in series include Model-A town sedan, Ford pickup, and roadster. \$2.98 each. Hubley Mfg. Co., Lancaster, Pa.



**AUTO COMPASS** is illuminated by flashlight bulb and penlight battery. In addition to telling you in which direction your road leads, it can be taken out of case for use as emergency flashlight. With dash-mounting bracket, \$6.95. Hull Mfg. Co., Warren, O.



**ELECTRIC EYE** now sets exposure automatically on Polaroid's smallest camera, pocket-size J33 taking 2 1/4-by-3 1/2-inch prints that finish in 10 seconds. Camera measures 3 by 4 1/2 by 7 1/2 inches closed. It costs \$74.95. Polaroid Corp., 741 Main St., Cambridge, Mass.



**MICROSCOPE** has zoom mechanism that allows young scientist to put slide in focus, then magnify it 1,000 times. It swings 180 degrees, tilts 90 degrees, lights specimen above and below. \$12.98 to \$24.98. A. C. Gilbert Co., 49 Erector Sq., New Haven, Conn.



## WHAT'S NEW for Christmas.....



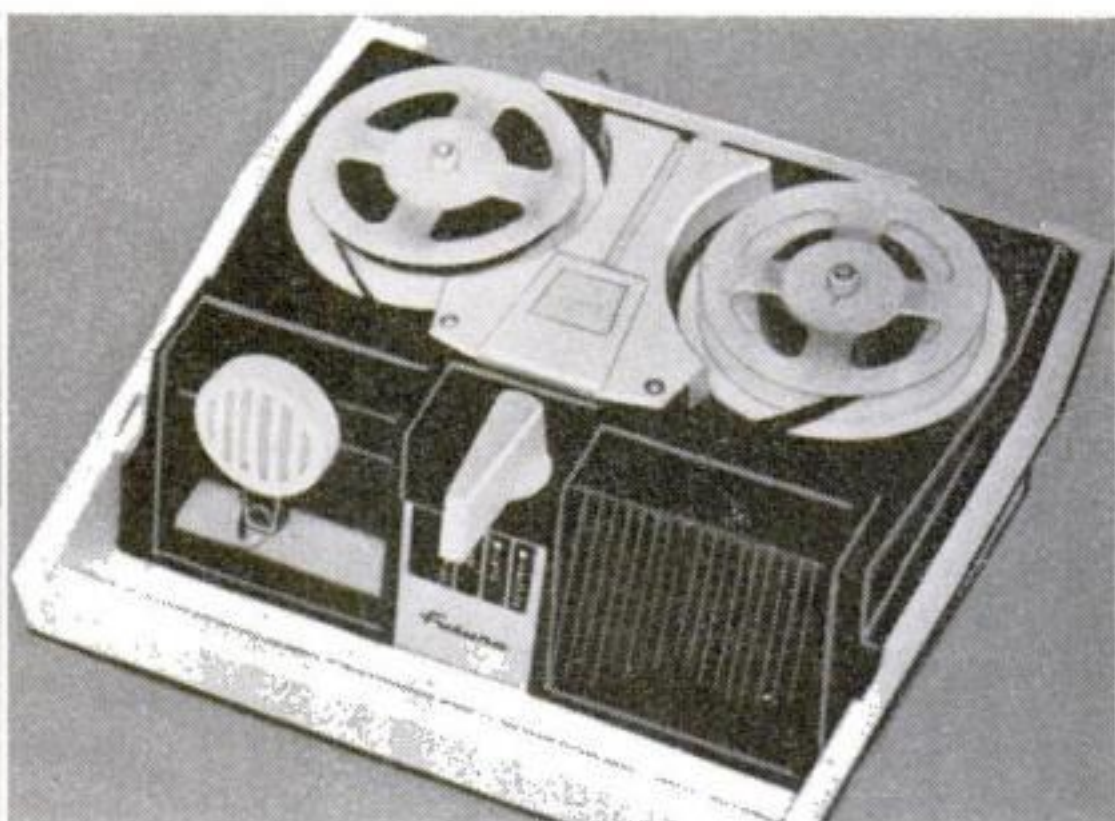
**ELECTRIC BACKSCRATCHER** runs on house current, has a built-in motor that works five plastic fingers up and down your spine 3,000 times a minute. It's 18 inches long, adds that much to your reach in relieving an inaccessible tickle. It costs \$4.98. Mrs. Dorothy Damar, 769 Damar Bldg., Elizabeth, N.J.



**PIVOTING LENS MOUNT** wipes superwide-angle image across curved strip of 16-mm. film in Japanese camera. You photograph a parade with click of shutter. Mount revolves 120 degrees during exposure. Viscawide 16, with case, infrared filter, six rolls of film, \$39.95. Silver Bells, Box 982, Carmel, Calif.



**WEATHER FORECASTER** helps junior meteorologists measure wind speed, rainfall, barometric pressure, temperature-humidity index, relative humidity, to predict what's ahead for tomorrow. One of a series of science sets, it contains precision-made anemometer, sling psychrometer, barometer, and other instruments. Two models, \$9.95 and \$19.95. Lionel Corp., 15 E. 26 St., NYC.



**TAPE RECORDER** is equipped with transistors instead of tubes, cutting down size. You can rewind, turn it off, play, or record with one control. Instrument operates on two D and one nine-volt transistor batteries, is not to be compared with those selling for \$200 up, but has good volume and tonal qualities. Price, without batteries, \$29.95. Edmund Scientific Co., Barrington, N.J.





**CAROUSEL PROJECTOR** holds 80 slides in revolving tray, drops them into light beam to be shown. You push a button to select brilliance for light or dark slides, or set it for automatic showing. Tray can be changed as easily as a phonograph record. About \$140. Eastman Kodak Co., Rochester, N.Y.



**ROBOT COMMANDO** is battery-operated one-man army that responds to voice commands, moves about, hurls bombs and rockets, and as final maneuver flips its lid to fire missile from head. Robot and mike are powered by three D flash batteries. Without batteries, \$23. Ideal Toy Corp., 200 Fifth Ave., NYC.



**WORKING MODEL** of Chrysler Slant-6 powering Valiant and Lancer is  $\frac{1}{4}$ -scale engine young mechanic can assemble from 200 parts in kit. Section of block can be taken off so you see parts moving. With booklet, it sells for \$12.95. Revell, Inc., Venice, Calif.

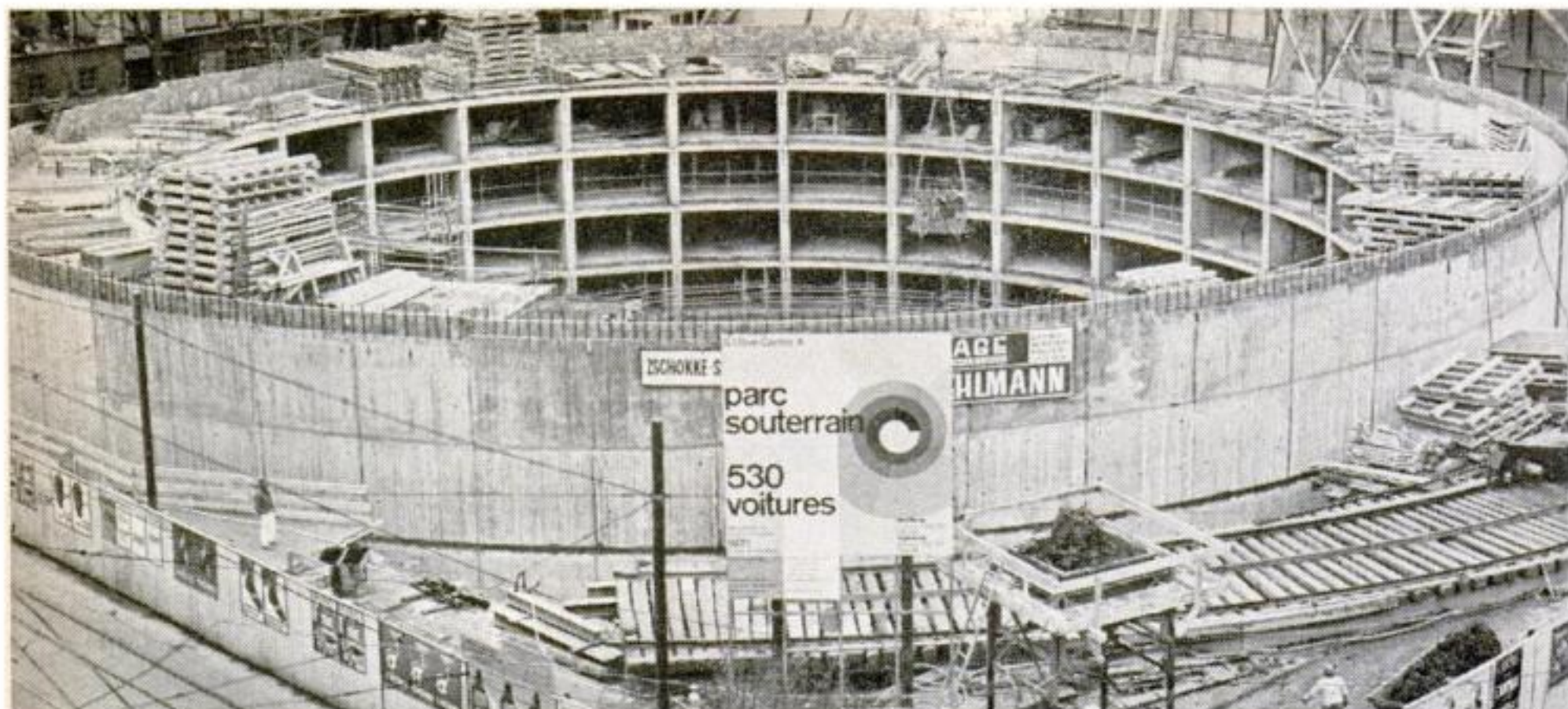


**COASTRAY** is combination coaster and ash tray. Pull out drawer from under plastic and absorbent-sponge coaster, and you have burnproof tray that holds ashes or lighted cigarette. Set of four costs \$2. Harold Franzen & Co., 180 King Bldg., Flanagan, Ill.



**BICYCLE MOTOR** is  $2\frac{1}{2}$ -hp., 2-cycle engine that mounts over front wheel to enable you to ride up to 30 m.p.h. Throttle control is on handlebar. Maker says 2-quart tank of gas is good for 50 to 75 miles. Kit is \$70. Go-Byk Industries, Box 85, Rothsay, Minn.

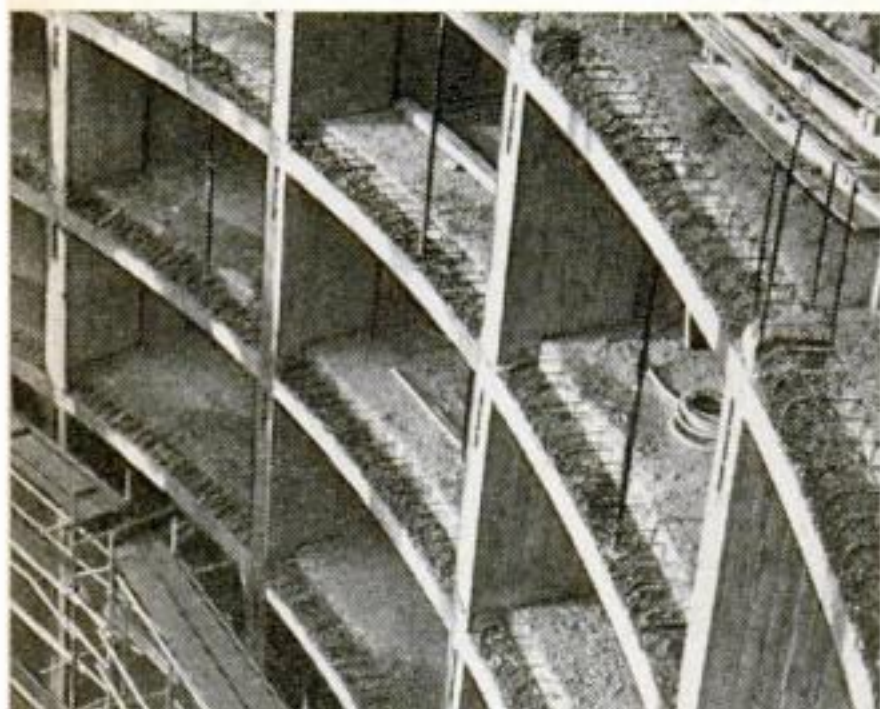




**FOUR OF NINE STORIES** had been built when this photograph was taken. Billboard in the fore-

ground announces site is for underground garage that will accommodate 530 cars.

## Garage sinks in ground to go up



**TWO-CAR STALLS** look like this from inside during construction. Ramps winding around interior will connect each parking level with street above for easy access to storage.

Excavation and construction go on simultaneously for a nine-story underground parking garage that will take 530 cars off streets in Geneva, Switzerland.

The garage is actually being built above ground in a reinforced-concrete circle of twin-car storage compartments. At the same time it is being undercut by big mechanical shovels and bucket cranes that lift the soil over the wall to be hauled away in waiting trucks. To keep the garage sinking evenly all around and avoid ruptures in the concrete, the earth is softened by constant hosing. So far, settling is at the rate of a little more than a third of an inch an hour.

The subterranean garage is scheduled to be completed sometime next year. When finished, it will be covered with concrete and provided with ramps.



## Lifeboat launched

A new lifeboat station at one of Britain's most dangerous coastlines is 20 feet above high-tide level to protect the craft from storms. Launching down a slipway on V-shaped roller tracks that support the

**LIFEBOAT SLIDES** on ramp from station at base of steep 152-foot cliff at Kilcobben, Cornwall.

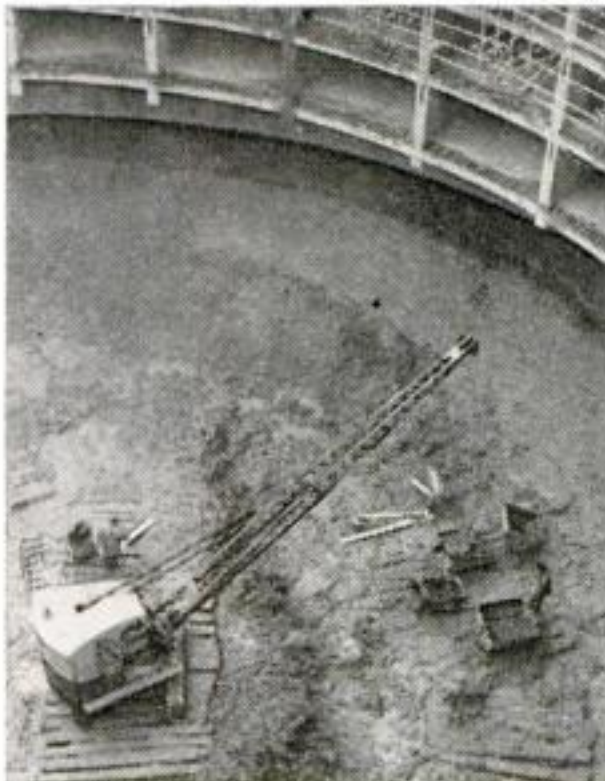




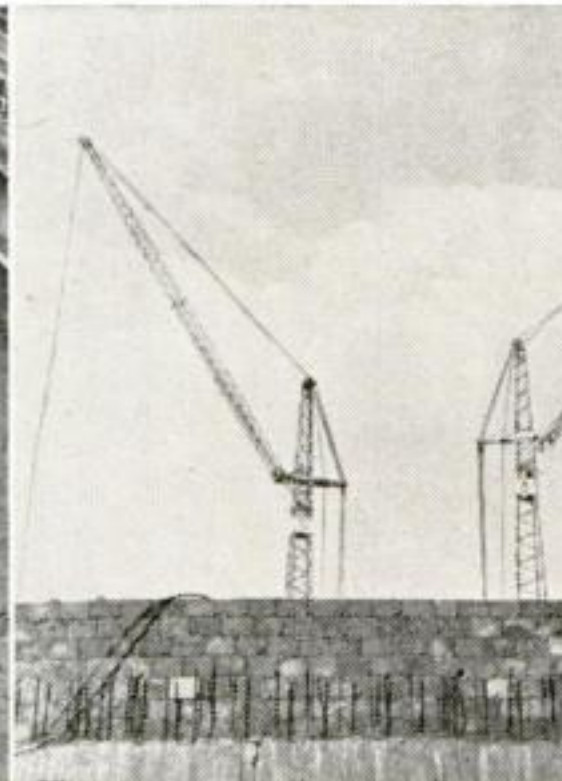
**EXTERIOR WALL** built above ground is calked by workmen before being sunk below surface.



**WATER-SOAKING** from pipeline softens earth to help structure sink evenly all around.



**MECHANICAL SHOVEL** digs huge hole for underground garage while construction goes on, undercutting below base so structure can be buried.



**TALL HOISTING CRANES** dive into bottom of ever-growing hole to lift out big buckets of loosened earth and deposit them outside wall.



**DUMP TRUCKS** in steady stream haul excavated earth away to site outside city. They drive under the scaffold to pick up load from chute built on top.

## down ramp

hull speeds takeoff in emergencies. On return, the boat is winched stern-first back up the ramp. One of the world's largest and most modern, the lifeboat is 52 feet long and carries 100 persons.

**PLATFORM CAR** ferries crewmen to boathouse and saves shipwreck victims precious minutes.





# Highway Post Office Carries Mixed Bag of Mail

**"Wash-Harris HPO" postmarks everything—chicks to cash—on its Shenandoah Valley run**

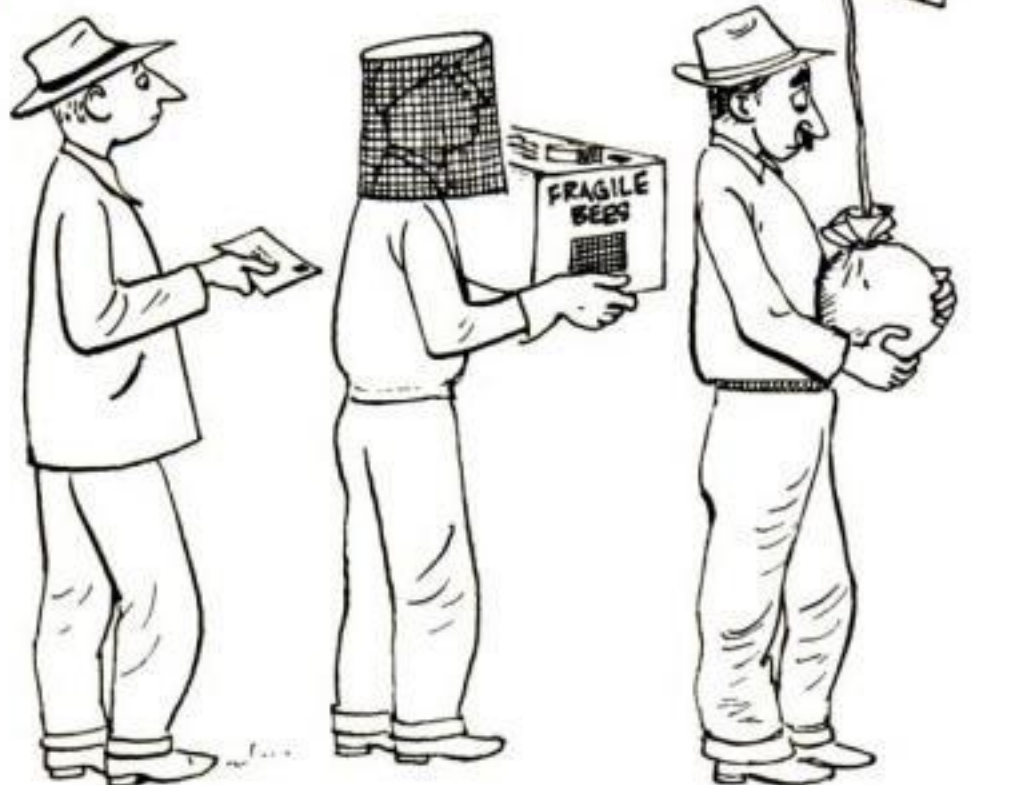
**By Richard Petrow**

**I**T WAS four a.m., and raining, when the Washington-Harrisonburg Highway Post Office pulled away from its terminal in the capital and sloshed into Virginia.

Inside the big red-white-and-blue bus, two postal clerks were attacking a mountain of mail. Six hours later, at the end of the morning trip, they would still be working . . . and the mountain would still be there.

The "Wash-Harris HPO" is one of 197 highway post offices in this country that "peddle the mail" to areas not served by railroads. This smooth-running HPO fleet is a little-known facet of postal service that promises to grow with the progressive decline of railroads.

With special permission from postal authorities, therefore, I recently made the 351-mile Wash-Harris round trip to re-



port what goes on inside a rolling post office on a typical working day.

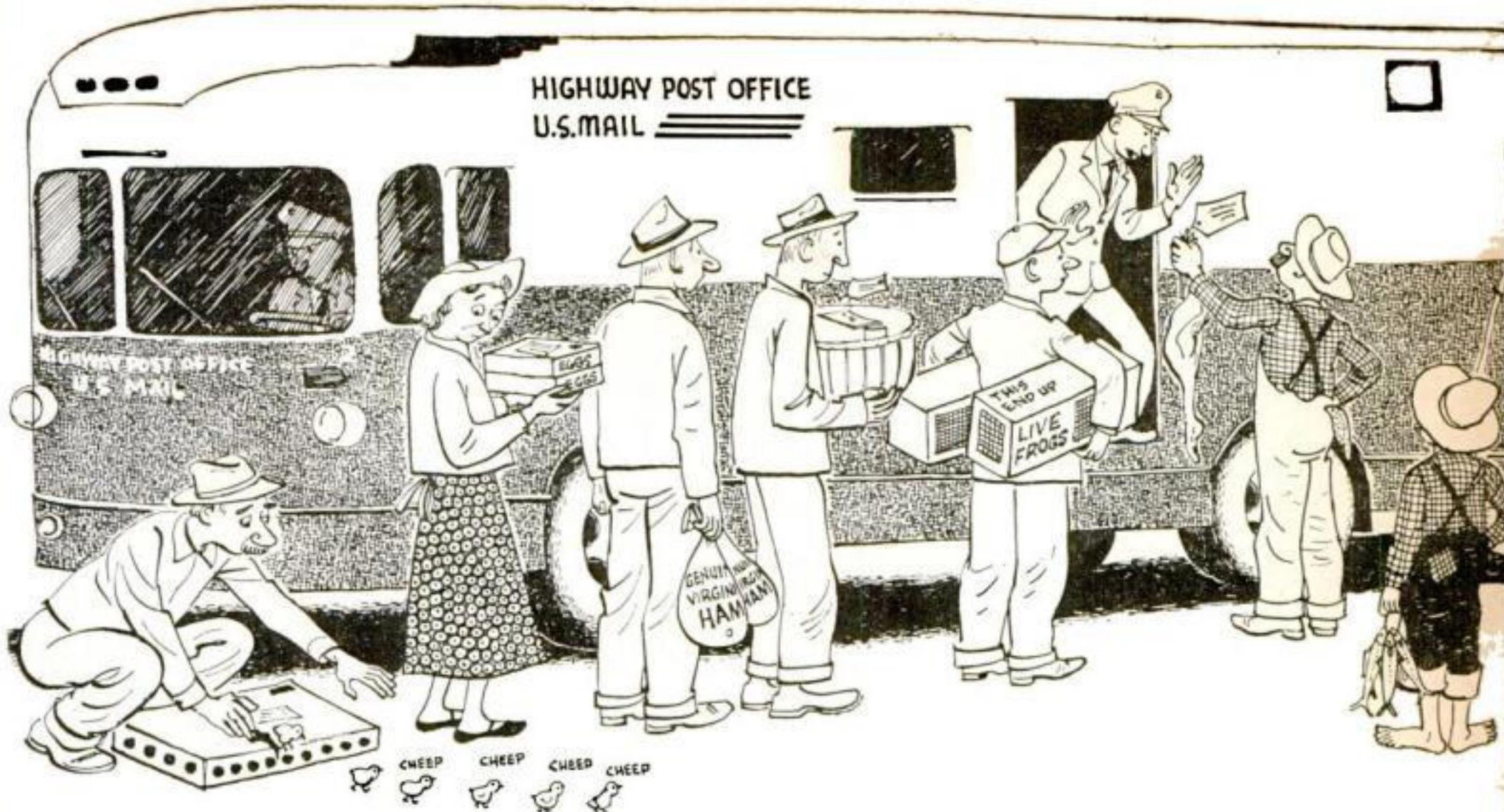
Our route would take us through the hunt-and-hound country of Northern Virginia, across the top of the Blue Ridge Mountains, and down the Shenandoah Valley. POPULAR SCIENCE photographer Bill Morris followed along in his station wagon, to shoot the pictures.

Orville Liskey welcomed us when we arrived at the Washington truck terminal. The time was an eye-rubbing 3:30 a.m.



**RED-WHITE-AND-BLUE** bus stops near tiny hamlet of Overall, Va., to deliver a sack of mail to messenger James E. R. Foster. He, in turn, will deliver it to his wife, postmistress at Overall. Foster has been meeting the Wash-Harris HPO at this junction since its first trip in 1941. HPO makes the 351-mile round trip between Washington and Harrisonburg, Va., six times a week to service 19 small communities along the way.





Liskey has been riding the Wash-Harris HPO since its inaugural trip in 1941. He was to be our guide on the morning run to Harrisonburg, Va. "This is the oldest HPO in operation," he said. "At one time or another, we've carried everything that's mailable."

**We roll.** Sharply at four a.m., driver Leon Simmons shifted into first and pulled the HPO away from its loading platform. We carried 165 bulging bags of mail, many four feet high and packed drum-tight.

"The mail comes into Washington during the night," Liskey explained. "We

load it between three and four a.m., then work it as we roll."

As we moved into the countryside outside Washington, Liskey told me that an HPO performs the functions of a regular post office, except serving the public.

"Every so often someone will stop us to post a letter," Liskey added, "but generally speaking the public doesn't know what we do. Or why."

Neither did I. I asked for details.

"In 1941," Liskey said, "the Southern Railway Co. cut out passenger train service between Washington, Harrisonburg, and Lexington. This eliminated the rail-

**ON THE INSIDE** of the rolling post office, senior clerk Orville Liskey (left) works the case while Fred Miller sorts mail into sacks and bins. There is never a slack half-hour, for the men take on mail sacks at every stop. On a typical day, Liskey and Miller can expect to handle more than 100,000 letters and more than 200 sacks of parcel post and second-class mail. Many postal clerks can't take HPO duty—the ceaseless rocking of the bus makes them carsick.







**OLD-VIRGINIA HAMS** smoked at the Earman farm in Harrisonburg, Va., are loaded aboard.



**SURROUNDED** by 291 boxes and pouches he'll work, Irvine Crawford (right) briefs reporter.

way post office on this run and disrupted mail service in the area."

Mail had to be "worked" (sorted) in Washington, instead of in a moving railroad post office. Naturally, this delayed its arrival. Then someone in the department came up with the idea of replacing the railroad post office with one that rolled on the highways.

"Our HPO speeds delivery by 24 hours," Liskey said. "That often means the difference between a Saturday delivery and a Monday delivery."

The HPO is a 36-foot diesel-powered bus divided into two compartments—a rear storage compartment, and a forward section with a wooden work platform, a cubbyhole case with 216 boxes, 15 overhead boxes, and racks holding 60 open-mouthed canvas pouches.

*Working the mail.* Teamed with Liskey was Fred Miller, the "sack man." Miller opened the pouches of mail, handed first-class and registered mail to Liskey, the "case man," and then distributed the packages and papers into open sacks lined up near him. There was a sack for every community on our route.

We were on schedule at our first stop, Falls Church, Va. Within five minutes, we had backed into the loading platform, delivered our mail, taken on some pouches for "down the line," and had started rolling again.

From Falls Church, our route took us through Fairfax, Chantilly, and Aldie before we hit Middleburg, where President Kennedy's country estate is located.

The town was still asleep (it was 6:15 a.m.), and so was its post office. We de-

livered our mail (the HPO crew carries keys to all post offices), made a pickup (left for us the evening before), and were on our way.

"We get surprisingly little presidential mail for Middleburg," Liskey commented.

"What kind of mail are we carrying?" I asked.

Liskey turned to Miller. "Show him some of the stuff we have on board." With a grin, Miller reached into a sack and pulled out a long metal box.

I shook it. It didn't rattle.

"What's in it?"

"Eggs," Miller said. "We carry them all the time. These are from a woman with chickens to her married son."

Next Miller came up with a package marked "special handling" addressed to the Biology Department of Madison College in Harrisonburg. "Live frogs and lizards for the lab," he explained.

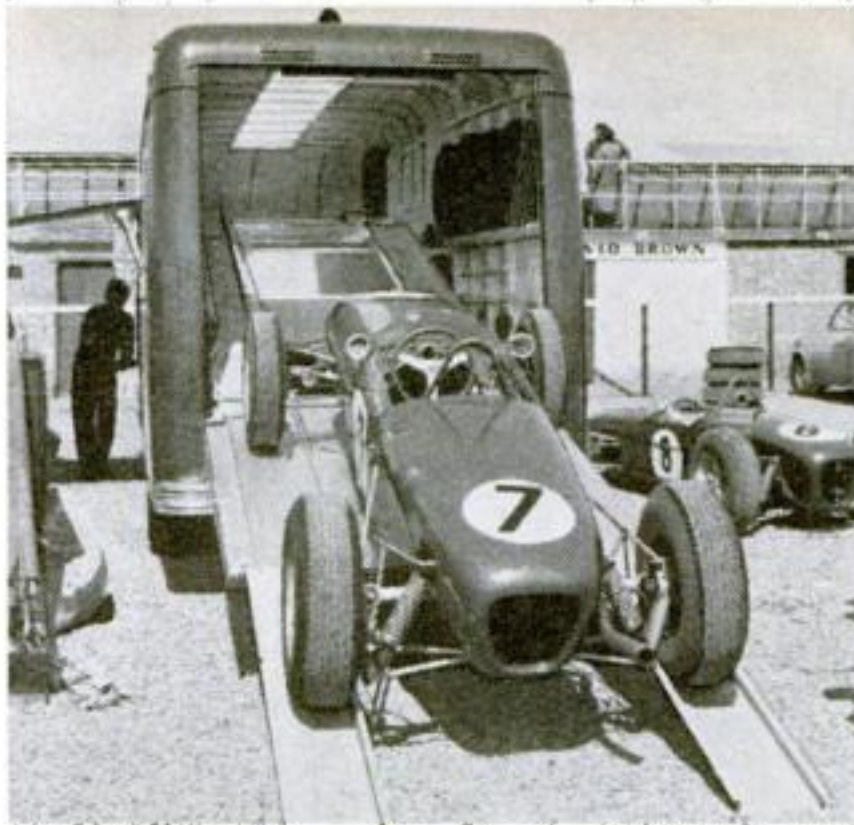
Then came several long thin packages that turned out to be trees from the state nursery, three packages of live bull semen for a cattle farmer in the valley, and a box of hamsters.

"Chickens, turkeys, and ring-necked pheasants are raised around Harrisonburg," Miller continued. "Young birds are shipped 200 to a box. We've moved as many as 10,000 chickens on one trip."

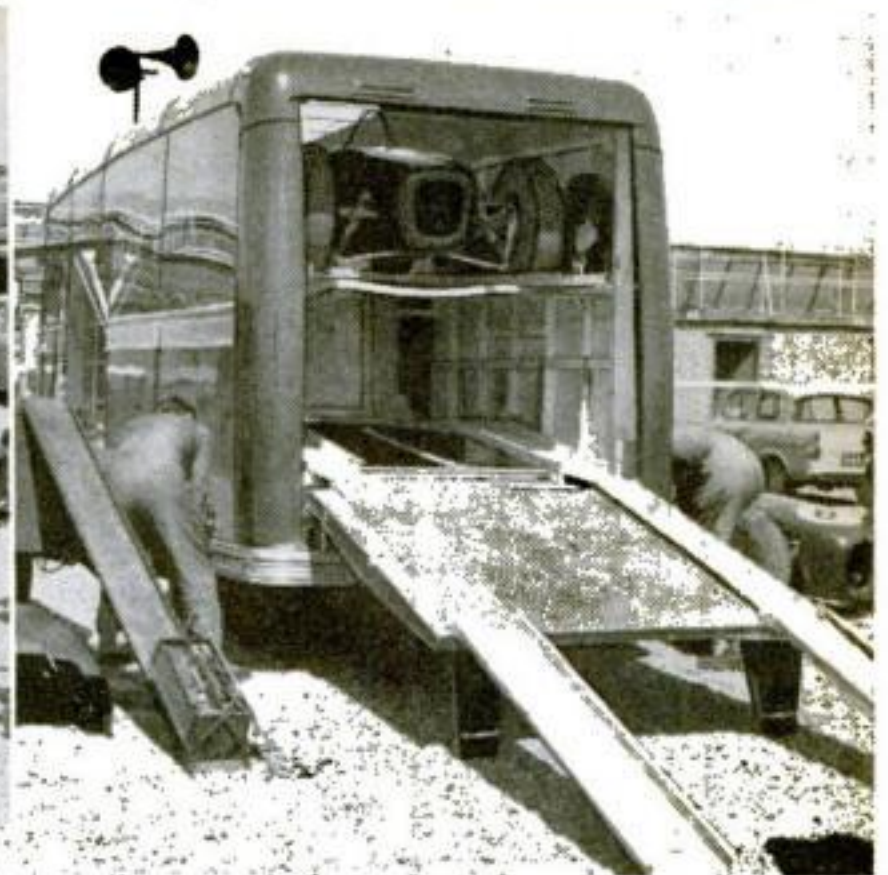
"And bees," Miller continued. "Queen bees are mailed in little wooden boxes about the size of a pack of cigarettes. Each box has a metal screen for ventilation and each queen bee has six or eight workers along for company."

*[Continued on page 190]*





Crank pulls first racer to upper deck . . .



. . . and second follows. Deck is jacked up . . .

### Three's a crowd in van

Tilting tracks and winches cram three racing cars into this double-deck transporter. The first car is hauled up a ramp to the upper level and loaded forward over the cab. The second follows. Then the upper level is elevated to horizontal. With the ramp dropped back to the lower level, the third car is pulled aboard.

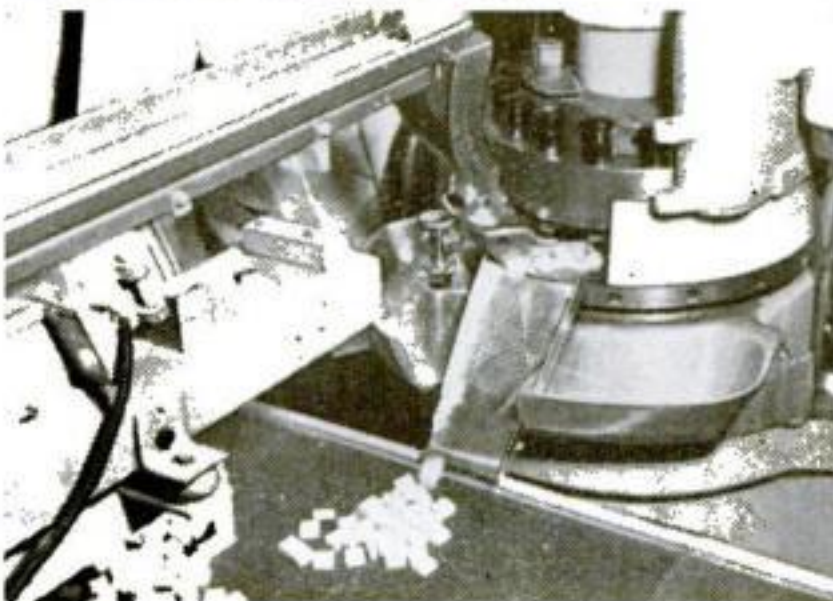
The transporter is built on a bus chassis. It has fitted storage racks for tools, spare tires, and an air compressor, and bunks to sleep two on long trips. The Lotus team uses it to attend racing meets in Britain and Europe.



. . . to make room for third on lower level.

### Two lumps of cream, please

The little white cubes tumbling out of the machine below at a canned-milk plant in Copenhagen, Denmark, look like lumps of sugar but are actually powdered cream. The compressed cubes are then wrapped individually in tinfoil. Unwrapped, they dissolve in coffee or tea.



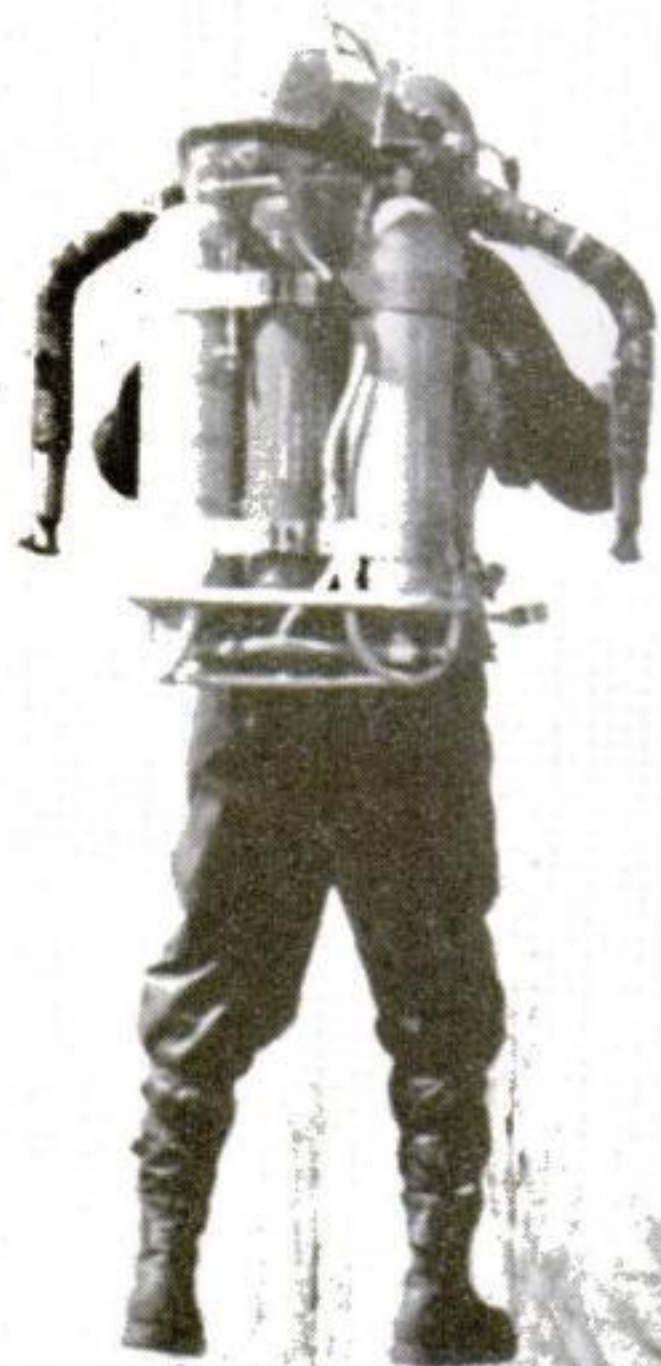
### Auto tows water skier

Newest sport along the crescent-shaped beach at Monterey, Calif., is water skiing while being towed by an auto. The girl on skis at right in the photo is being pulled at 20 m.p.h. by a four-wheel-drive Harvester Scout beach wagon fitted with large, low-pressure sand tires.





# **This Man Can Broad-Jump**



Rocket-belted flier rides shrieking jets. Steam is unseen on warm days, visible on cool ones.



# 368 Feet

***It's easy. He's propelled by steam jets with 300 pounds of thrust, in this startling new version of the rocket belt***

**By Robert Gannon**

**J**UST east of Niagara Falls on New York State Route 18, one morning last April, a waitress was driving home from an all-night diner. As she passed the grounds of Bell Aerosystems Company, a noise made her glance toward a roadside field. What she saw glued her eyes to the field, and her car rolled right into the ditch.

Emerging from a billowing cloud of steam, a goggled and helmeted man had risen into the air, jets of vapor spewing from tanks on his back.

Luckily only shaken up, the frightened woman had seen a pioneering free flight by a rocket-propelled human. In that initial trial the "test pilot" covered 100 feet—and he, too, was scared stiff, he told me later.

Today, after half a hundred flights, rocketman Harold M. Graham confidently twirls the controls of his flying belt and blasts himself off the ground. Lest the spectacle endanger neck-craning drivers, trials have been moved well out of sight of passing cars.

Right now, with a belt like Graham's,

**ROCKET BELT**, really a pack, has padded frame of fiber-glass molded to fit body. Motorcycle-style hand controls at front regulate fuel and check yawing. Jet nozzles, on each side of wearer, point down and slightly outward to keep hot jets away from him. Steam temperature, 600 degrees at nozzles, drops to 180 degrees at foot level.

FUEL CONTROL

FUEL-CAPACITY TIMER

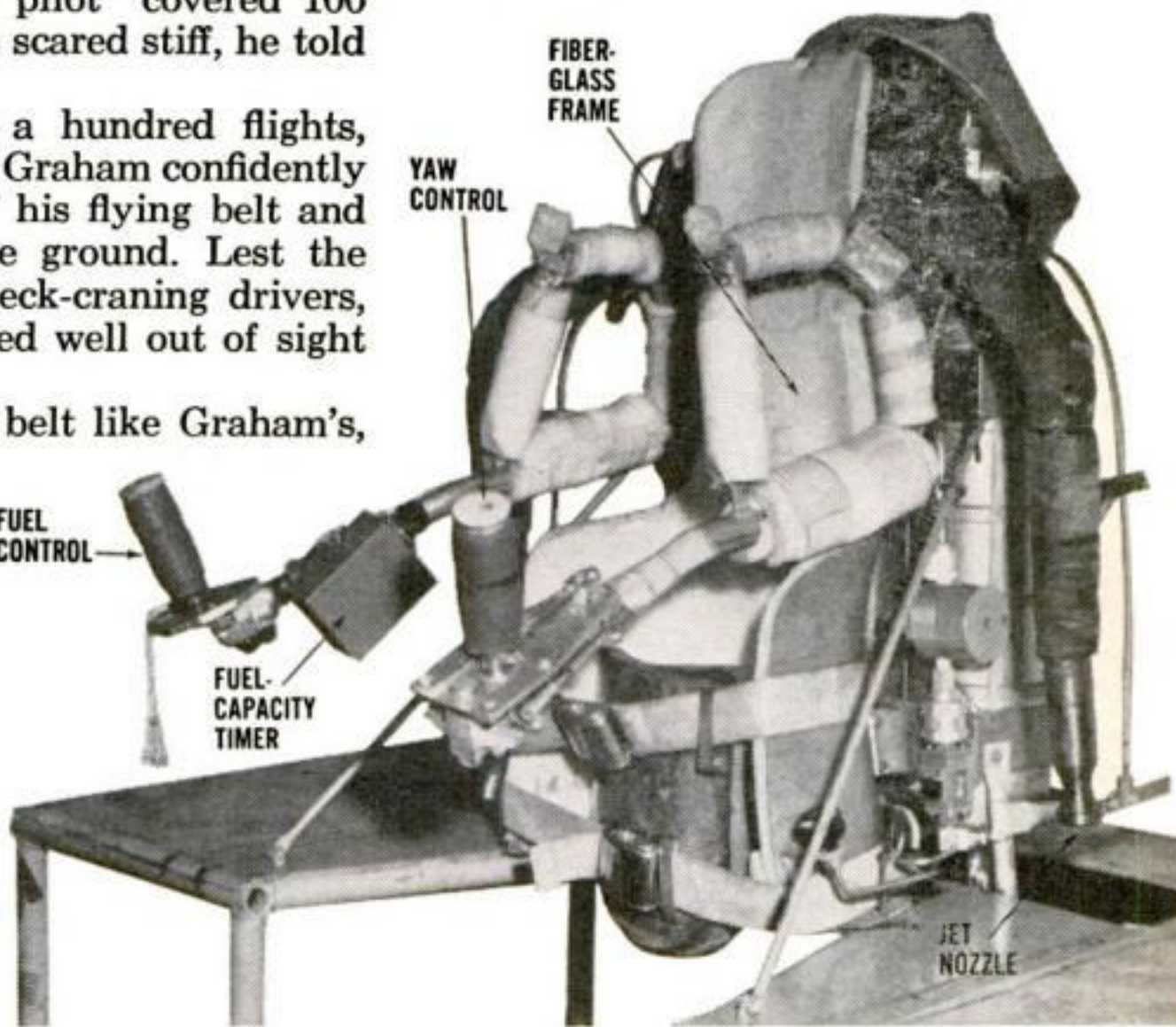
YAW CONTROL

FIBER-GLASS FRAME

JET NOZZLE



**TEST PILOT** Harold M. Graham, aided by helper, gets set for outdoor trial of flying belt. With present model, flight lasts up to 25 seconds. Cost per flight comes to about \$100.



CONTINUED





**TETHERED ON LINE** extending above his head, designer Wendell F. Moore tries out controls of rocket belt while crewman at lower right holds one of guide ropes taut. After Moore snagged a line, crashed, and broke knee in such a trial, free flights outdoors were found safer for pilot—but a hazard to neck-craning motorists, until moved away from roads.

any trained rocketeer can skim through the air at 35 m.p.h. for hundreds of feet, and come to a graceful two-point landing. Back-pack rockets roaring, he can step off a cliff and float safely to the ground below. He can flex his knees, give a little push, and soar to the roof of a four-story building.

*Soldiers wearing rocket belts* will swoosh over rivers, barbed wire, and mine fields. Many and varied civilian uses are expected, too.

The one-man rocket rig used by Graham is not the first. An experimental model with solid-fuel rockets, developed for military use by another firm, underwent trials three years ago. Performance figures were secret but, by unofficial estimate, it permitted 50-foot-long leaps.

The Bell design, in contrast, propels its wearer with flameless jets of steam. The present model has carried a man as far as 368 feet to date, and its maximum range is estimated at 500 feet.

The beauty of the device is its utter simplicity. Essentially all that happens is that 90-percent hydrogen peroxide (the same chemical compound that serves for hair bleaching) is run through tiny silver screens. For some reason—scientists don't know why—the catalytic action of the silver decomposes it. The hydrogen peroxide ( $H_2O_2$ ) breaks down into nascent or atomic oxygen (O) and water ( $H_2O$ )—plus tremendous heat, which vaporizes the water. The resulting steam, blasting from twin jets, gives 300 pounds of thrust for 25 seconds.

This flying belt was designed by Wendell F. Moore, a Bell aeronautical engineer working on small hydrogen peroxide rockets at the time. One evening in 1953,

with his three children in bed and his wife reading, he sat at the kitchen table doodling with a charcoal pencil. Whimsically he drew a couple of jets, a man between them, and fuel tanks on the man's back. Then, taking his fancy more seriously, he added valves, lines, pressure gauges. By dawn he had, substantially, today's jump-belt design.

On his own time, with spare parts contributed by Bell, he built a crude model with compressed-gas jets. It tangled in its trailing gas hose; the device would have to be self-contained. And money was lacking to try out Moore's idea of using peroxide for fuel.

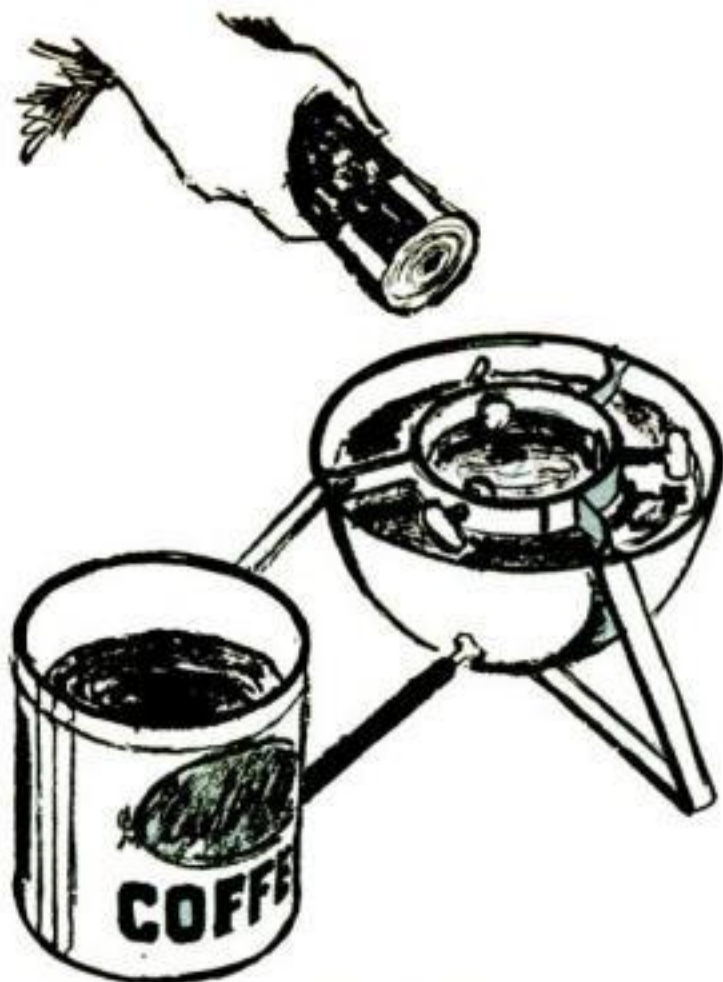
*The Army steps in.* In mid-1960 the Army's Transportation Command put out a call for devices to "improve mobility." Moore presented his far-out idea, it appealed, and Bell got a slice of Government money for experiments. But the \$150,000 that the Army tossed into the pot was still a pittance to meet modern research costs.

"So we economized," says Moore. "First, we cut red tape. We sketched plans on yellow scratch paper. This time, we agreed with the Army, no formal drawings." And none exist yet for the Small Rocket Lift Device, as the Army calls it. "Next, we cut time and cost by using hardware right off the shelf." Tanks are Air Force oxygen containers; valves are Mercury astronaut-capsule extras and missile-project leftovers.

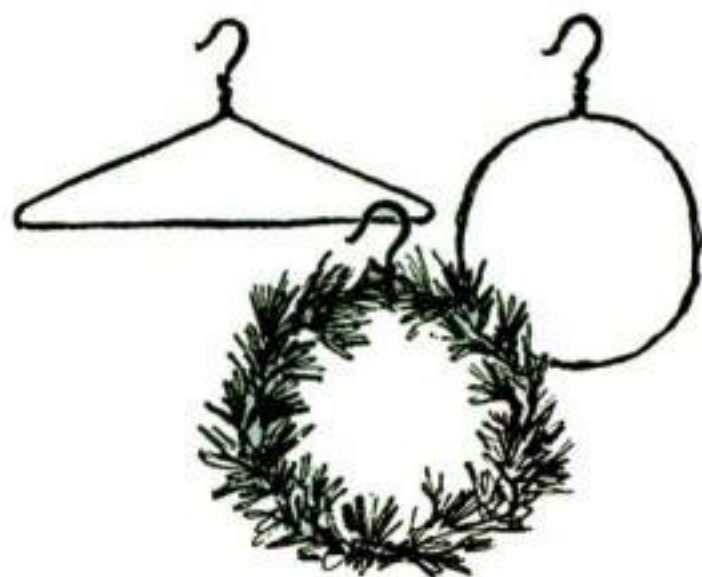
"We were trying to get the thing off the ground, not aiming for maximum efficiency." And get it off the ground they did, a couple of months later.

*[Continued on page 192]*



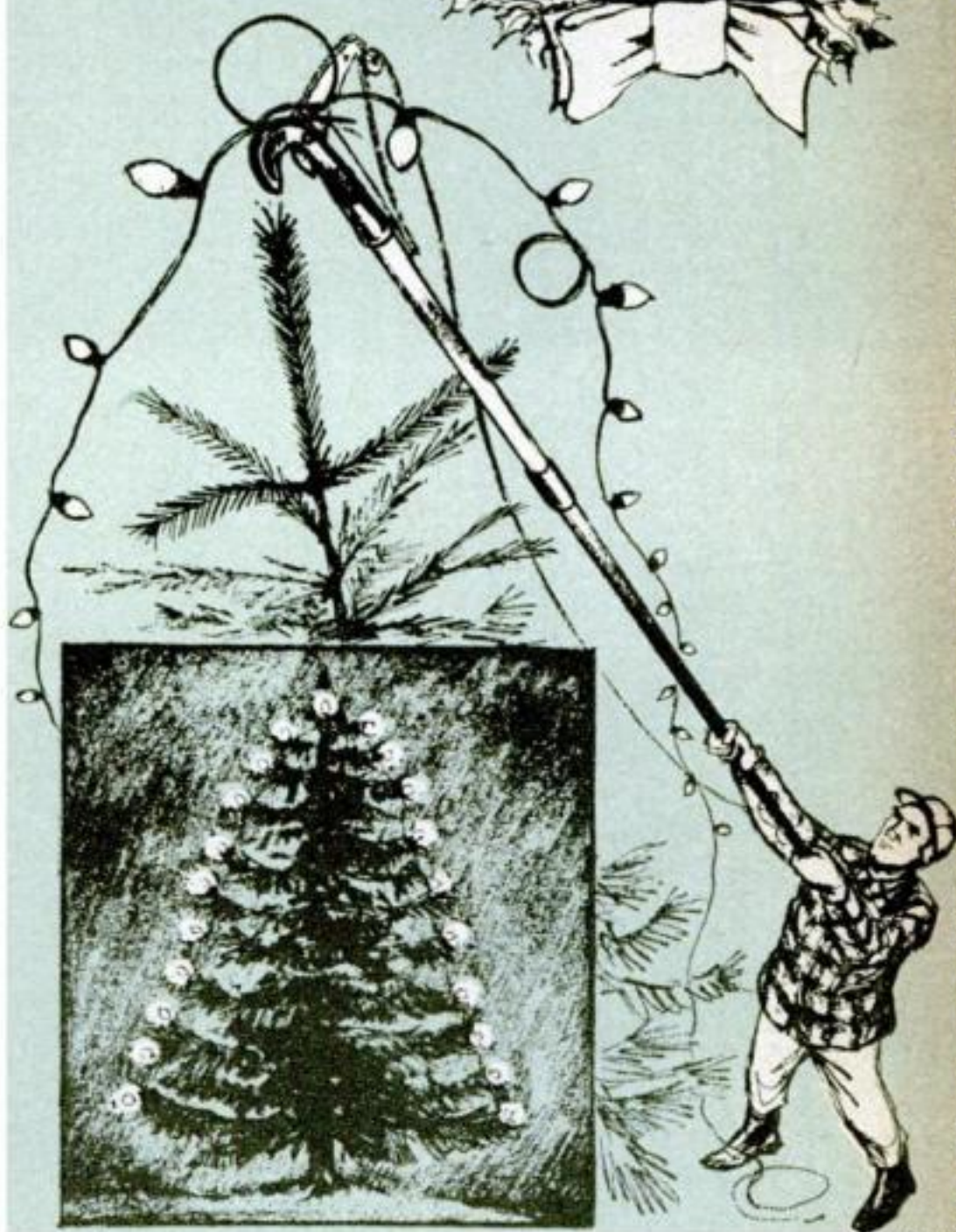


**Yule trees are thirsty** — especially if you remove 1"-by-2" strips of bark at four points around the base of the trunk to keep the needles fresh. In 15 days a Norway spruce tested at Rutgers University absorbed over 23 quarts of water. A two-pound coffee can behind the tree makes a good reservoir for a tree holder. Water feeds through a rubber hose slipped over copper tubing soldered into holes bored at the same level in can and holder.



**Make holiday wreaths** the easy way by shaping a wire clothes hanger into a circle and fastening pine branches around the ring with fine wire. Once the larger branches are secured, use smaller twigs to build up the wreath and conceal the wire. Decorate with tree ornaments. Leave the hook intact for hanging the wreath.

## Mechanics and Handicraft SECTION



**Decorating an outdoor tree** becomes tougher each year. The tree outgrows your stepladder, and your supply of lights looks skimpy when coiled around the branches. This year, why not just outline the tree with an inverted V of lights? Space sockets on the ground, securing slack loops with rubber bands. To hook light string over top of the tree, center it through a wire hoop; lift with forked stick or pruning pole.



# What Can YOU Do with Household Throwaways?

By Henry B. Comstock

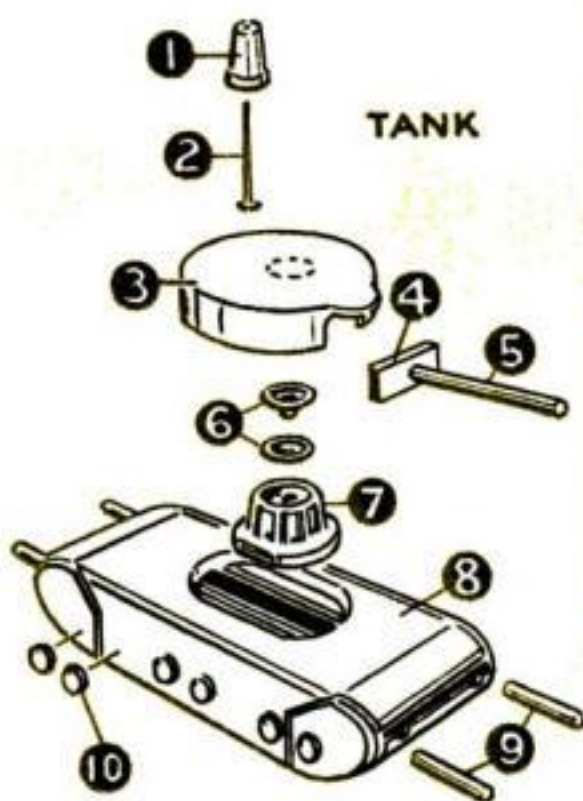
**T**HERE'S a gold mine in your trash can. Take a close look at those empty detergent bottles, dispensers, ball-point pens, and other plastic throwaways that you chuck out every day. You'll find they offer a wonderful array of ready-made shapes and parts that would take you a month of Sundays to duplicate from anything else.

With your wastebasket as your parts bin, these plastic discards provide a new kind of fun in home-construction projects such as these Christmas toys for small fry. Some of the shapes are perfect as they come—Gillette's plastic blade dispenser couldn't make a better army tank if it had been designed as a tank. Other parts can be adapted and combined in various ways to produce

elaborate built-up projects, such as the towering model-railroad station.

The ideas shown here are just a starter. The intricate little towboat—which can actually be powered to scoot along the floor—is proof that imagination is the only limit to what you can create with castoffs. This kind of fun used to be limited to—remember?—Mom's clothespins and empty thread spools. Now the wide use of molded plastics is turning it into a whole new art. You need only glue, a few cutting tools— and a sharp eye for shapes.

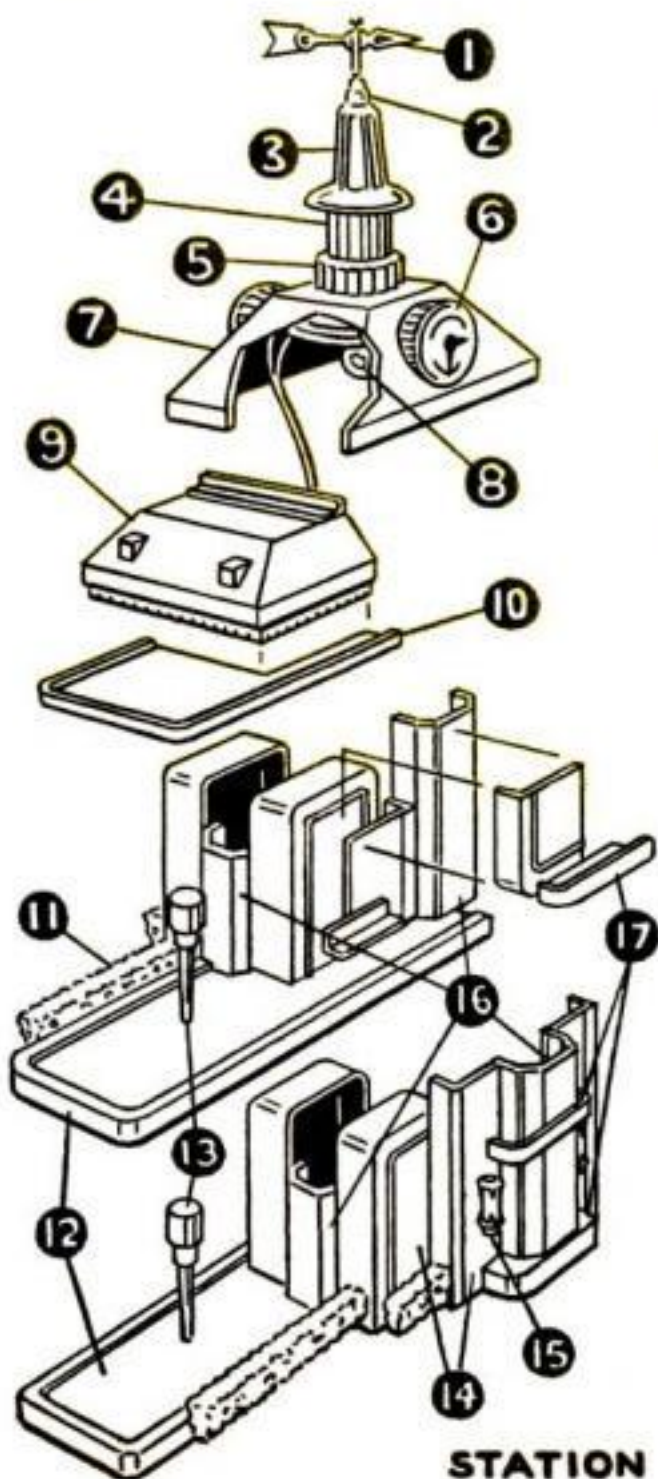
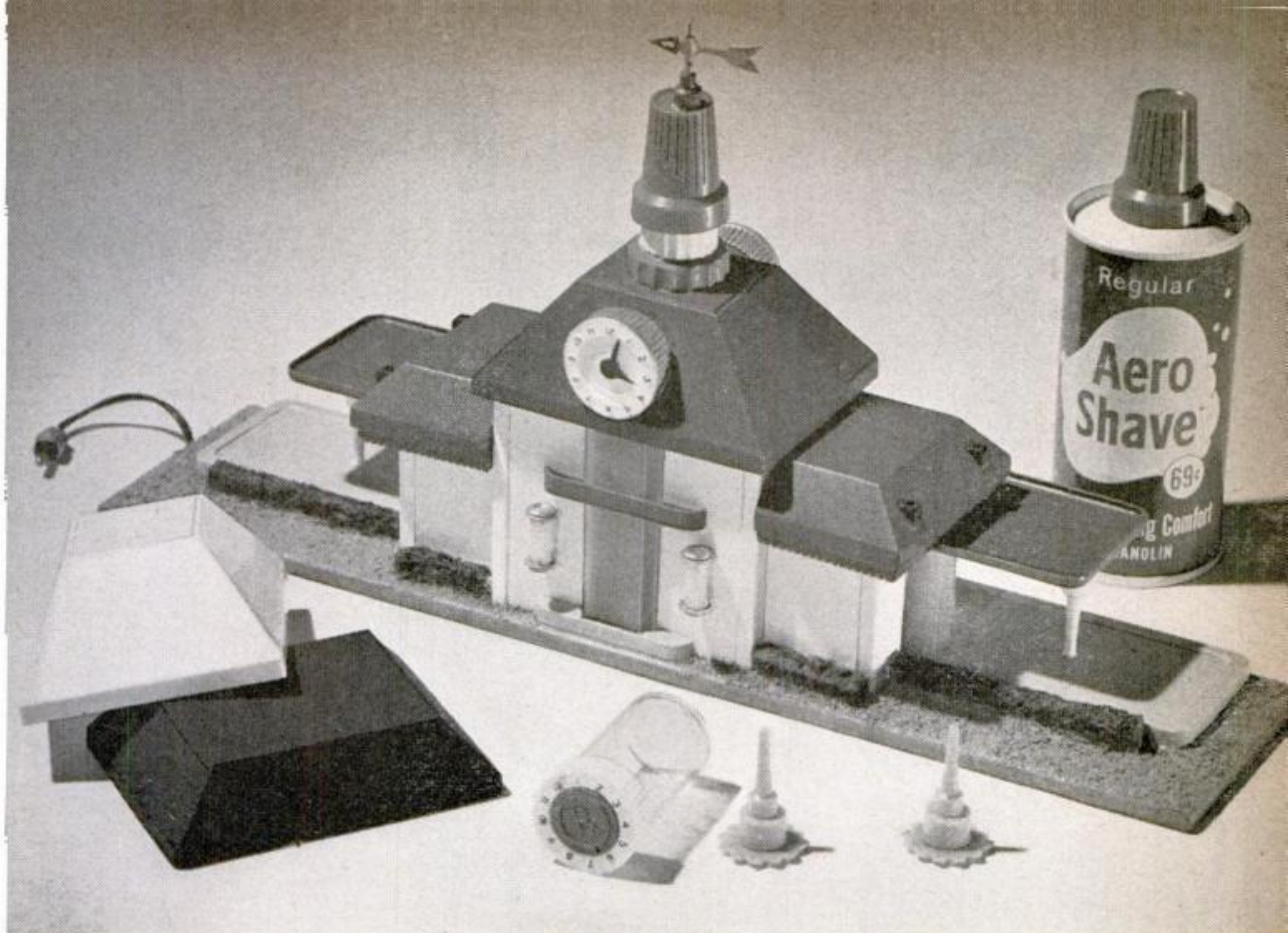
**Construction tips.** There's a great dif-



**RECOGNIZE THESE TANKS?** Bodies (8) are familiar plastic Gillette blade dispensers. Other parts are: 1. Elmer's glue cap; 2. pin with point removed; 3. Palmolive shave-cream cap; 4. section from muddler stem; 5 and 9. swab-stick sections; 6. dress snap; 7. toothpaste cap; 10. punchings from a shirt-collar stiffener. File sides of toothpaste cap flat to fit into tank body and drill hole in top for clearance of snap stud.







STATION

**STATION FOR AN HO TRAIN LAYOUT** makes ingenious use of a roof-shaped plastic watch box and miniature clock dials that come on pill-bottle caps. Dome can be colorfully night-lighted by installing small flashlight or Christmas-tree bulb inside. Parts are: 1. Old clock hand trimmed with scrap plastic for weather vane. Vane rotates on straight-pin shaft inserted in a bit of insulation tubing stripped from fine wire for a bearing. 2. tiny ointment-tube cap; 3. pressurized shave-cream cap; 4. Clairol hair-care-lotion cap; 5. detergent cap; 6. Rexall clock-dial pill-bottle cap, one on each side. Snap out dials from caps and grind on dummy clock hands. 7. Timex watch-box top; 8. flashlight reflector; 9. halved Timex watch-box bottom; 10. pencil-box lid sections; 11. strips from plastic sponge; 12, and 17. pencil-box lid sections; 13. stem from cake-candle holder; 14. pencil-box sections for all walls; 15. plastic eye-dropper stem with dress-snap prongs at ends; 16. octagonal toothbrush-box sections. Assemble the station on a base of  $\frac{1}{4}$ " plywood.

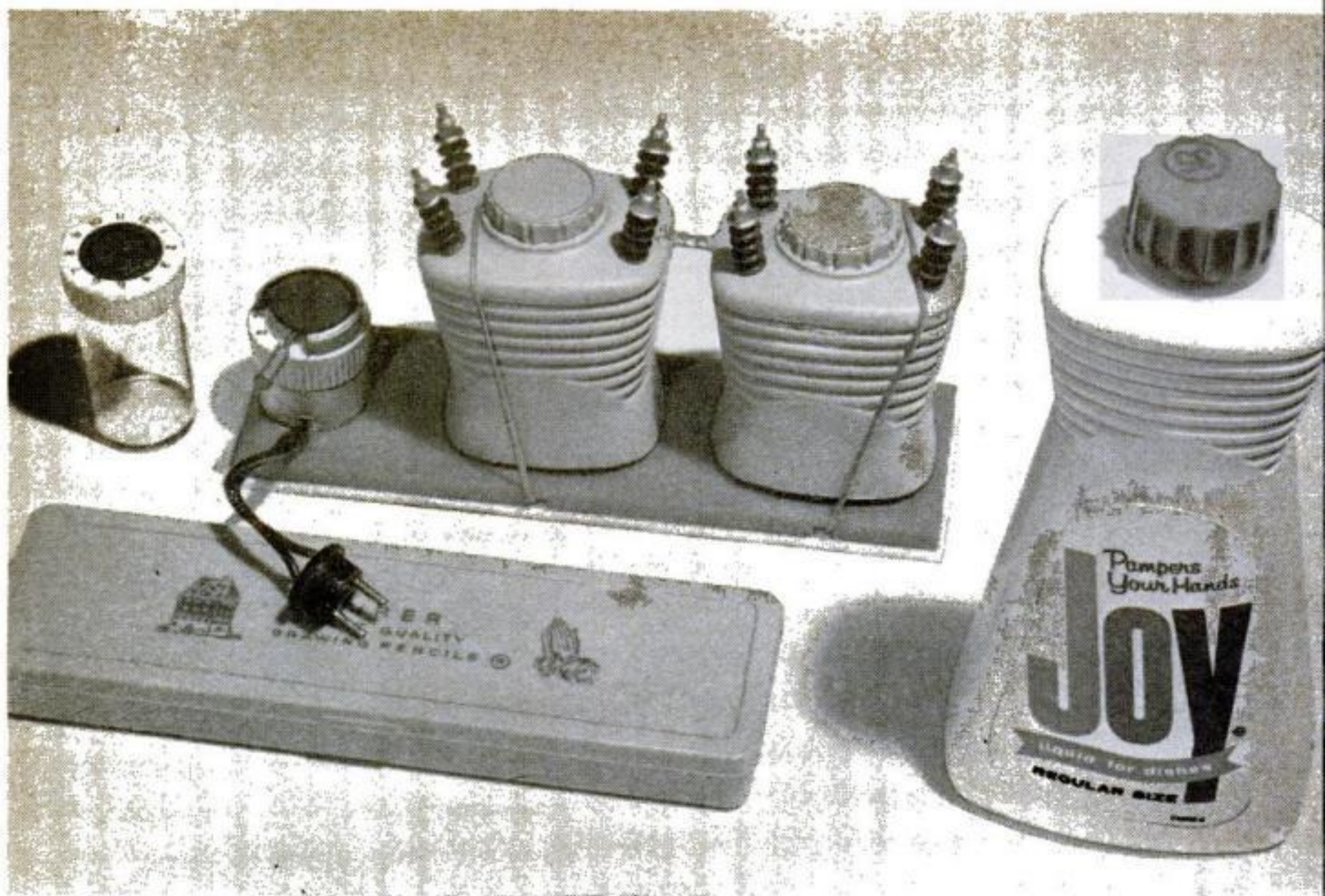
ference in plastics. The flexible, oily-to-the-touch material found in squeeze bottles is easy to cut with a knife or scissors. Other stock, used mainly for cosmetic-bottle caps is almost as hard as porcelain.

Between the two extremes are more common rigid types that aren't too hard but are very brittle. Here a knife or scissors won't do. The right cutting tool is an aluminum oxide grinding point

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III



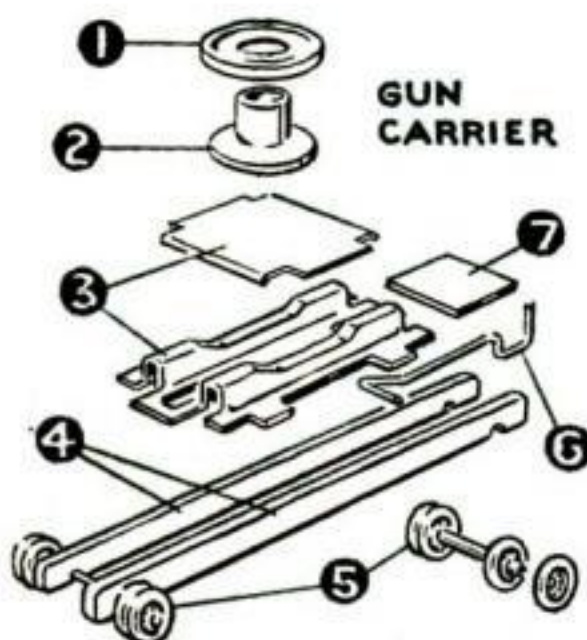


chucked in an electric drill or hand grinder. A point 1" in diameter is all you need. With this, you start with a rough cut about  $\frac{1}{8}$ " back from the final trim line. Try one and you'll see why. Friction heat melts a bit of the plastic during hard grinding and the edge may become mushy. When this happens, back the point off for a few seconds to let the stock reharden.

After roughing cuts, snap off the burrs of plastic along the edges with your thumbnail. Then grind to the final trim line with light passes.

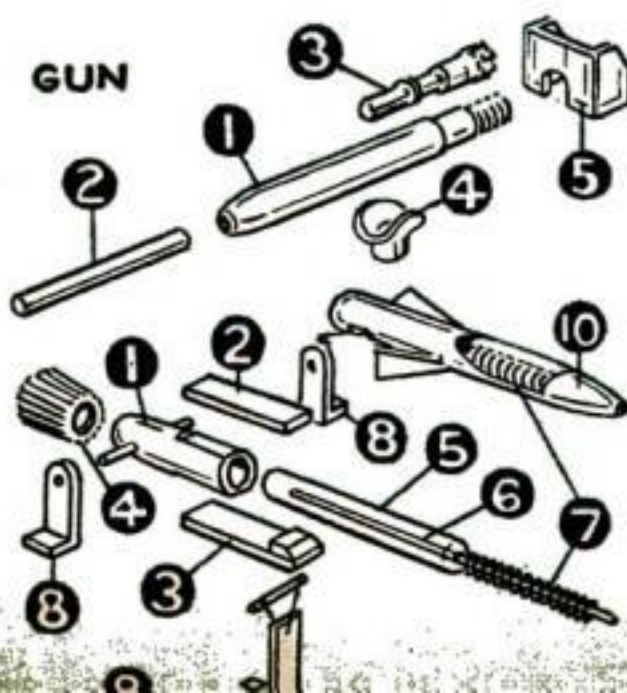
*Where holes are needed,* you can either drill or burn them through. For the latter, heat a pointed wire held in pliers until it glows. Press the point through the plastic and withdraw it quickly before the metal cools; if you don't the hardening resin may cling to it.

Use your drill or grinder as a lathe for cutting grooves in



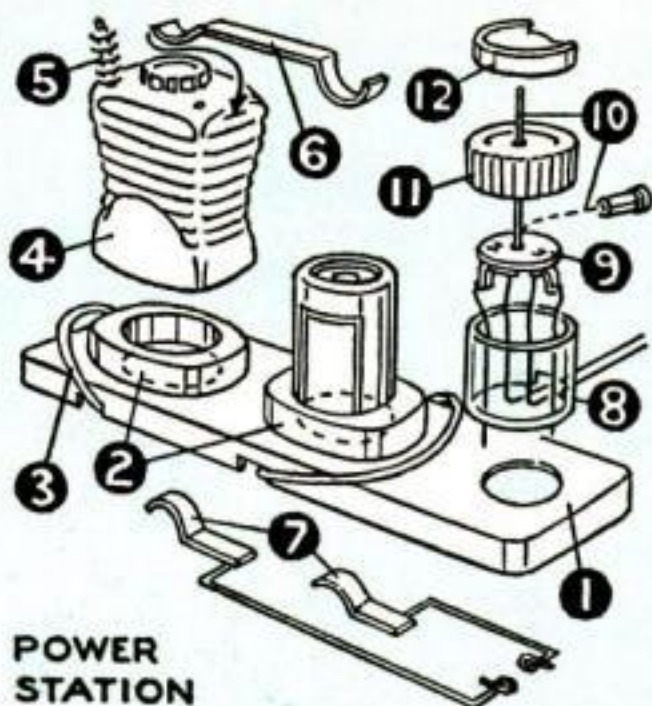
**WHEELED CARRIER** totes a rocket or cannon, as at right. Turret swivel is end of 35-mm. film cartridge (1) and end of 35-mm. film spool (2). Other parts are: 3. Gillette dispenser blade - advancing mechanism; 4. muddlers; 5. paired dress snaps drilled through studs for force fit on hanger-wire axles; 6. hanger wire; 7. scrap plastic.

**GUN AND ROCKET** come from ball-point pen. Gun parts are: 1. lower section of pen; 2.  $\frac{1}{8}$ " dowel; 3. ball-point mechanism (to release, grind off pen barrel above clip). 4. dress-snap adaptor; 5. section from toothbrush box.



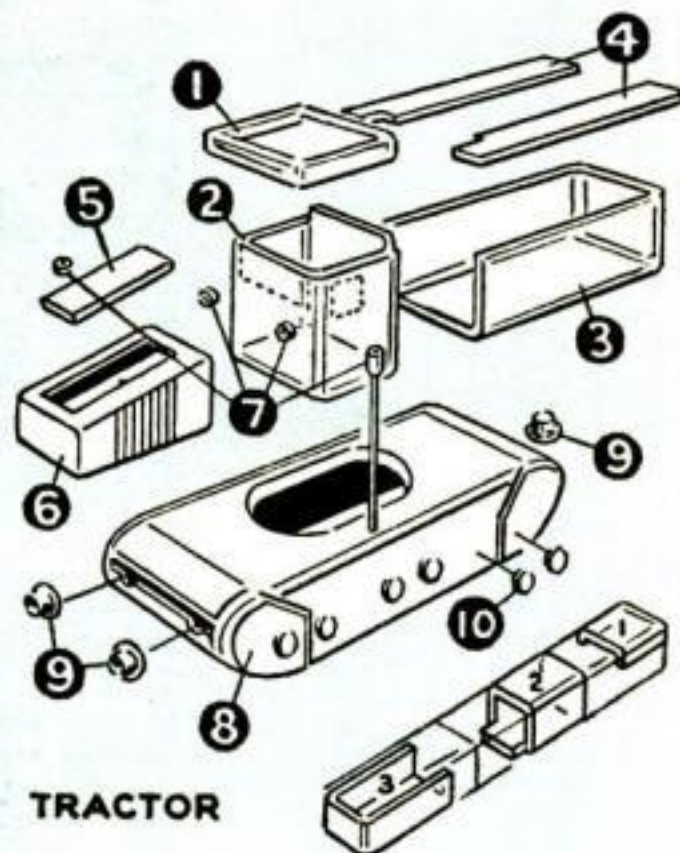
**ROCKET REALLY FIRES.** Parts are: 1. upper pen half; 2 and 3. plastic scrap; 4. toothpaste cap; 5. dropper stem; 6. pen cartridge; 7. springs; 8 and 9. angles from box corners (9 has thread-and-wire trip mechanism); 10. lower pen half, notched at rear. To fire, press rocket on springs until notch engages. Depressing 4 trips release.





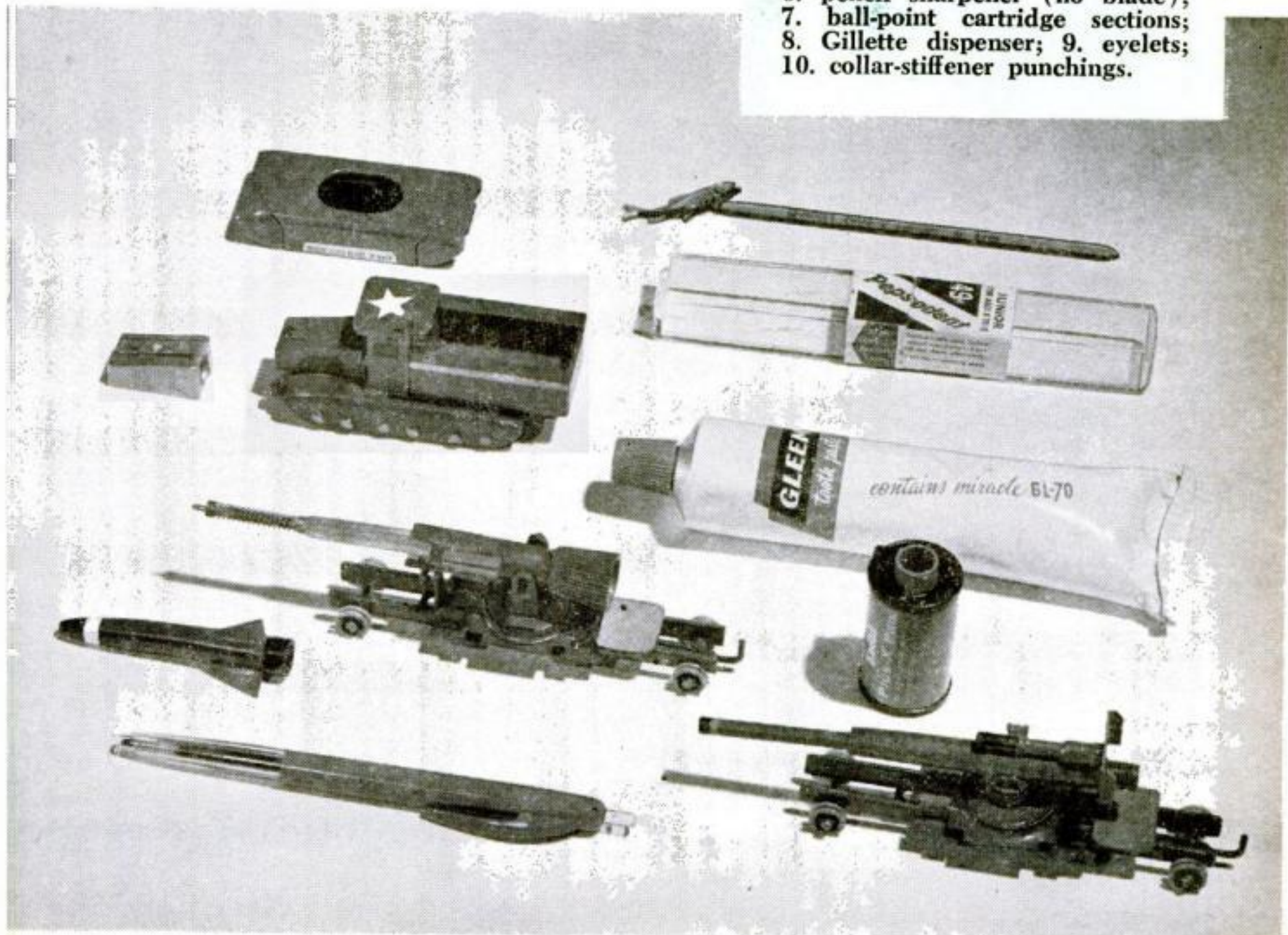
**POWER  
STATION**

**POWER STATION** puts out current from two hidden C cells. Parts are: 1. pencil-box lid; 2. hardboard; 3. rubber bands; 4. top of Joy bottle; 5. eyelets on swab stick; 6 and 7. tin-can stock; 8 and 12. pill-bottle sections; 9. old toy reverse switch; 10. wire with clock stem, bent for switch handle; 11. clock-dial pill cap. Invert one cell for series hookup.



**TRACTOR**

**TRACTOR PARTS** are: 1, 2, and 3. sections of Pepsodent child-size toothbrush box (seen in photo); 4. muddler shanks; 5. scrap plastic; 6. pencil sharpener (no blade); 7. ball-point cartridge sections; 8. Gillette dispenser; 9. eyelets; 10. collar-stiffener punchings.





plastic caps for pulleys. Mount the work on a mandrel or on a machine screw with two washers and a nut; shape with a file or chisel.

**Choosing the right adhesive.** Ordinary glues are unsatisfactory for many plastics. Your best choice is one of the thin cements that dissolve the plastic a bit and fuse it into a strong bond—Revell's Type S, for example. Apply it sparingly and position the parts immediately.

Exceptions are porcelain-hard plastics, the flexible, waxy ones, and bonds between plastic and metal. Here you should use epoxy glue.

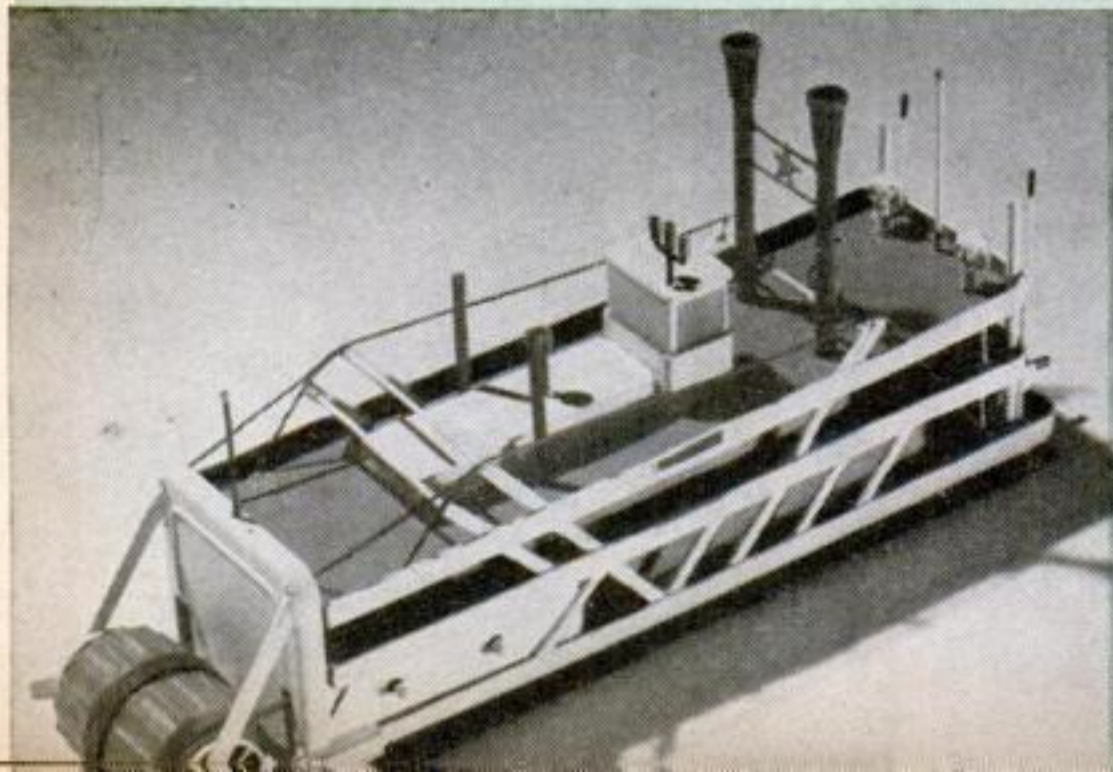
This glue may take up to eight hours to set, but can be speeded up with an

infrared heat lamp. Place the lamp at least 2' away or the whole assembly may wilt. Trapped air inside an enclosed part may also expand when heated and pop the part off. You can bypass this trouble by drilling vent holes in all of the sealed parts.

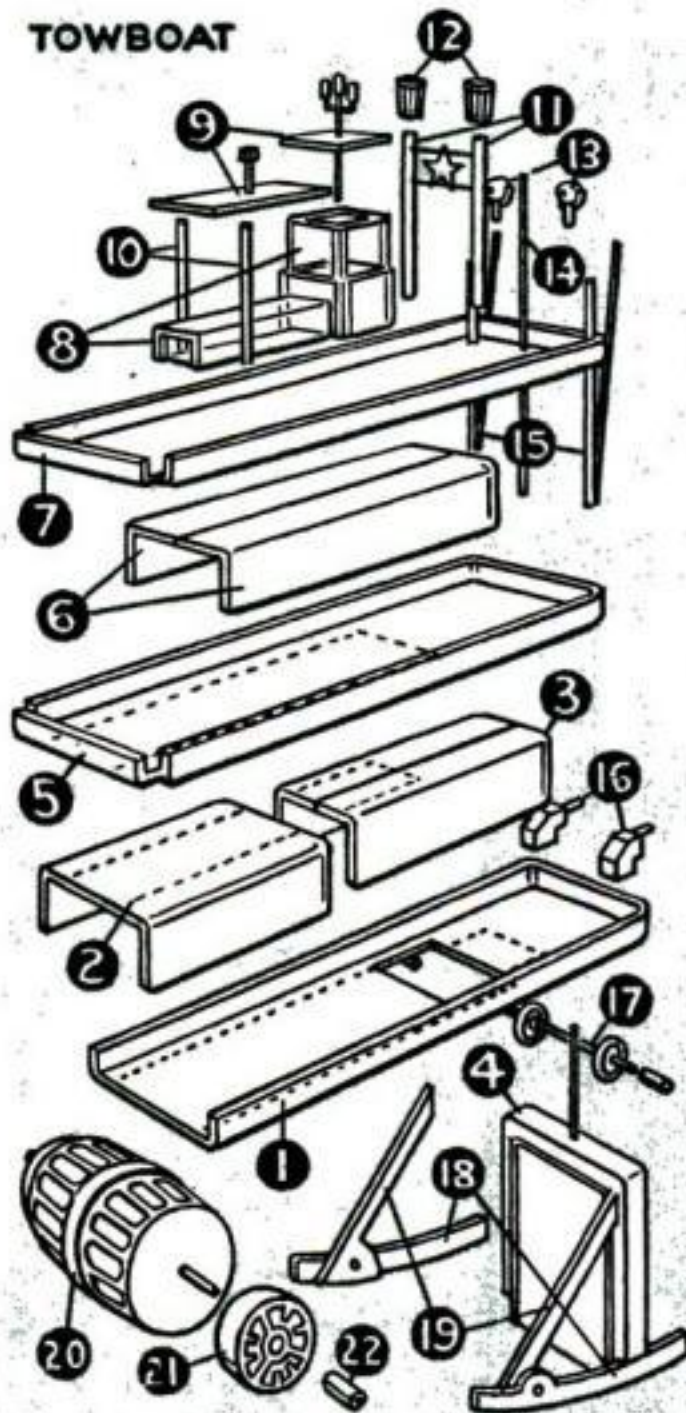
**Imagination helps.** No dimensions are given for the Christmas toys because sizes are determined largely by the discards you have at hand. If you can't find a recommended part, there are usually others just as good.

For motorized toys, you'll need small pulleys. These can be made by cementing toothpaste caps or solderless connectors to shafts forced through them. ■ ■

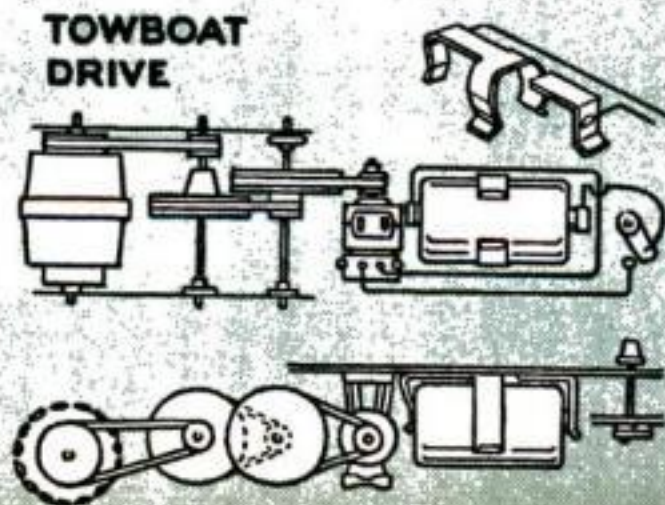
**STERN-WHEEL TOWBOAT** rolls on hidden front wheels and rear "paddle" wheel, can even be powered, as shown, with small battery motor belted to a real reduction drive with rubber bands. Hull and cabin parts (1 through 7) are from plastic pencil boxes, the lids for decks. Hull bottom (1) should project  $\frac{1}{4}$ " ahead of decks 5 and 7. Parts 2, 5, and 7 are flush at stern against 4. Diagonal trusses are paper matches bridged with fine wire. Other parts are: 8. sections of adult- and child-size Pepsodent toothbrush boxes; 9. plastic scraps for roofs, ointment-tube cap for galley stack, bits of wire insulation for whistles; 10. swab sticks; 11.  $\frac{1}{16}$ " dowels with paper star on wires; 12. tube caps; 13. medicine-dropper tips cradled in dress-snap halves; 14. wire; 15. swab sticks with wire booms; 16. balsa blocks with wire barge couplers; 17. dress-snap sockets on wire axle, with sections of brass ball-point cartridge for bearings; 18 and 19. plastic scrap; 20. detergent caps with rubber band around joint for traction; 21. section from Aero Shave cap; 22. plastic ink-cartridge sections for bearings. To add power, grind away all areas shown in dotted lines and drill holes in part 2 for pulley shafts. Motor and battery clip are hung from underside of part 6. Mount motor on toothpaste-cap pedestal to lower it. Through-deck switch can be made by adding stem to salvaged toy switch, as shown, or battery can simply be removed or inverted to stop or reverse boat. Reduction pulleys are turnings from detergent caps and solderless connectors. Use dress-snap sockets for shaft stops. Grind groove in part 21 to take rubber band that drives stern wheel.



**TOWBOAT**



**TOWBOAT DRIVE**







**F**OUR dials do all the brainwork when you use this table-top star finder—no need for paper-and-pencil figuring. Given four facts, you can quickly seek out and identify heavenly bodies that otherwise you might never see in the vastness of the sky. These facts are:

- The date you're using the finder.
- Your local standard time.
- The right ascension of the star in degrees or hours.
- Its declination.

Right ascension and declination are coordinates that astronomers use to locate stars. The first measures *along* the celestial equator, the second to the north and south of it. Just as you can locate a tiny island at the intersection of its longitude and latitude, you can pinpoint a sky target by its right ascension and declination. But as the earth turns on its axis and through its orbit, the sky that you see keeps changing. That's why you need the hour and date, too.

The star finder is also a seven-power telescope. Low magnification provides a generous field of view—about six degrees in diameter—making it easier to locate the sky objects you're seeking. It also makes the stars some 40 times brighter than when viewed with the naked eye. Where you can normally see only 5,000 stars, this telescope brings more than



## HOW TO MAKE A Star Finder for the Space Age

**By Capt. John E. Fox**

*At the time he built this star finder and wrote the article, the author was assistant professor of astronomy in the new Department of Earth, Space, and Graphic Science at the U. S. Military Academy, West Point.*

*We bring you his article because, ever since Sputnik, more and more eyes have been turning to the heavens with a new interest in astronomy. The finder will help you see what's up there.*



100,000 into view. And it emphasizes the color of the brighter ones.

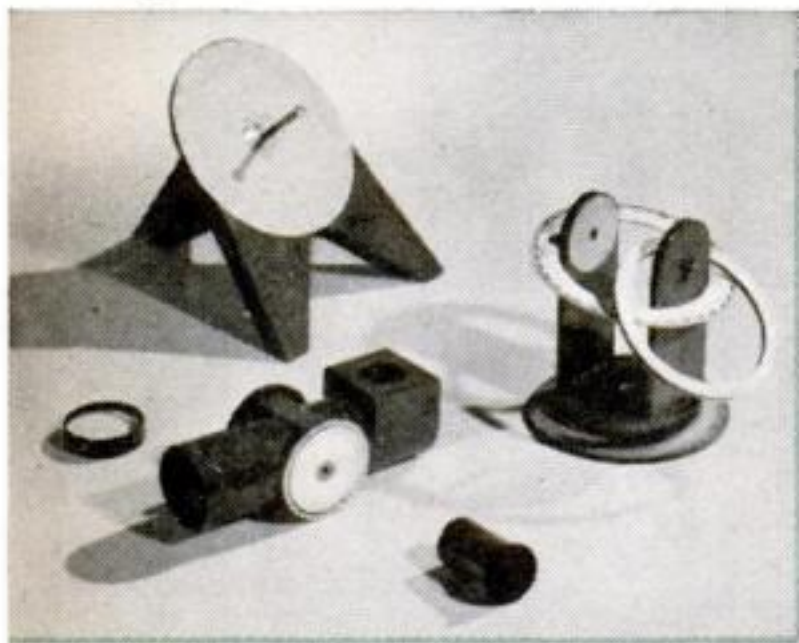
It also lets you see certain star clusters, nebulae, and some of the nearby galaxies—and it makes a fine satellite tracker. It's easy to operate, simple and inexpensive to build. Buy only what you can't make yourself, and the total cost will be under \$5.

**The eyepiece.** If you buy a regular 7x50 binocular eyepiece, that cost is nearly doubled. But you can make your own from instructions that come with the lenses you'll need. Our eyepiece contains two identical plano-convex lenses having diameters of 21 mm. and focal lengths of 41 mm. Assembled as shown in the cross-section sketch on the facing page, they produce a Ramsden eyepiece with a 1" focal length. The outside diameter of the housing determines the size of the hole to

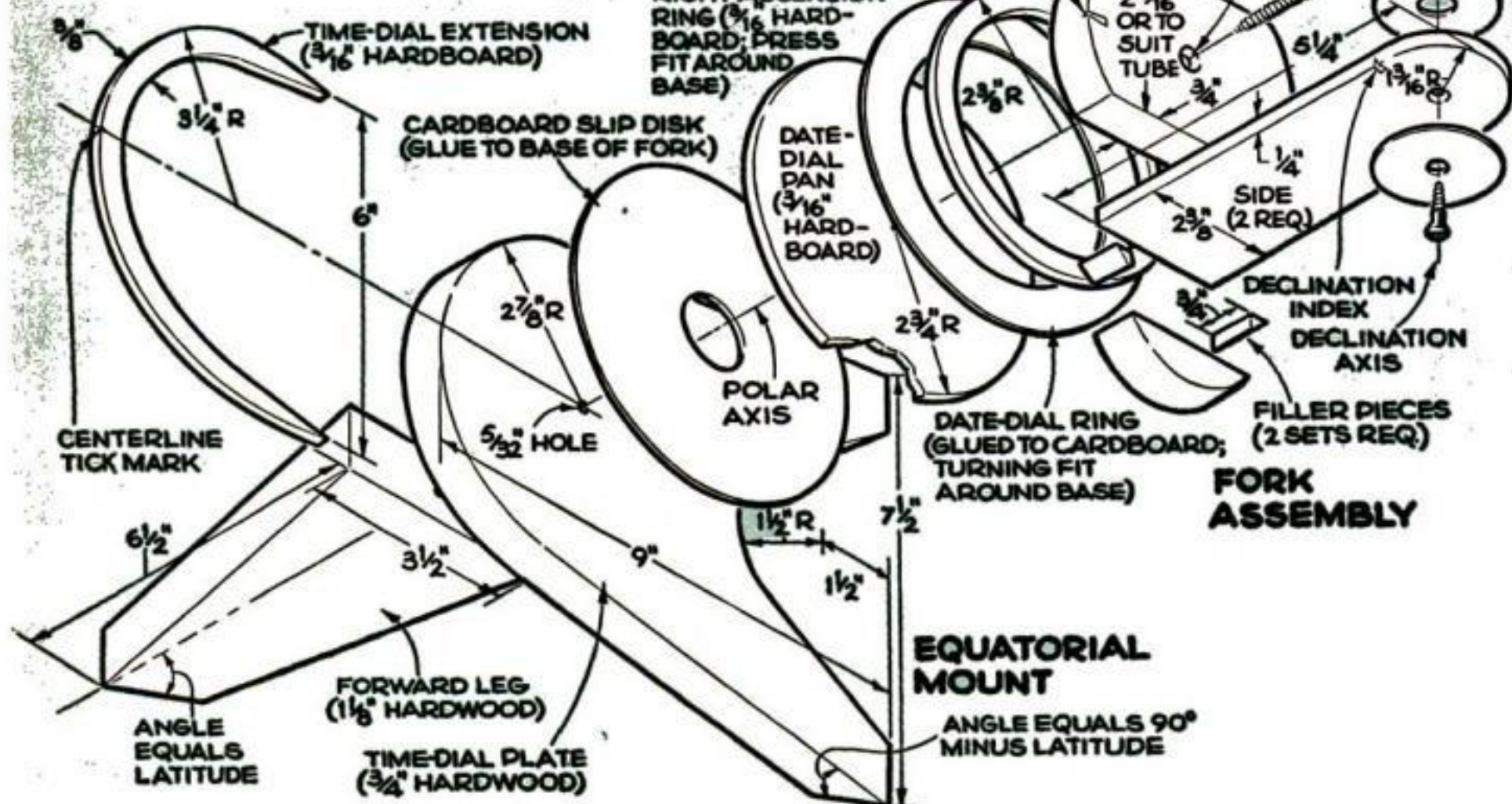
be bored in the eyepiece holder. The inside of the tube is painted dull black.

**The telescope itself** is a  $\frac{1}{8}$ "-thick cardboard mailing tube with a 2" inner diameter. A ring is sliced from one end to form the cell for the objective lens. By stripping off one or two inside layers of paper it's possible to wedge in the lens; but be sure it's seated at right angles to the optical axis. At the other end of the tube, make a  $2\frac{1}{4}$ " cut along the side, then slice down at right angles so you can peel half the tube open. Glue in the center light stop, then the rear light stop and eyepiece block. After the glue sets, drill a hole through the tube, centered on the light stop and perpendicular to the optical axis. A dowel can be run through this hole as a guide for gluing on the declination disks and brackets. Glue the mirror to its mount, silvered side up.

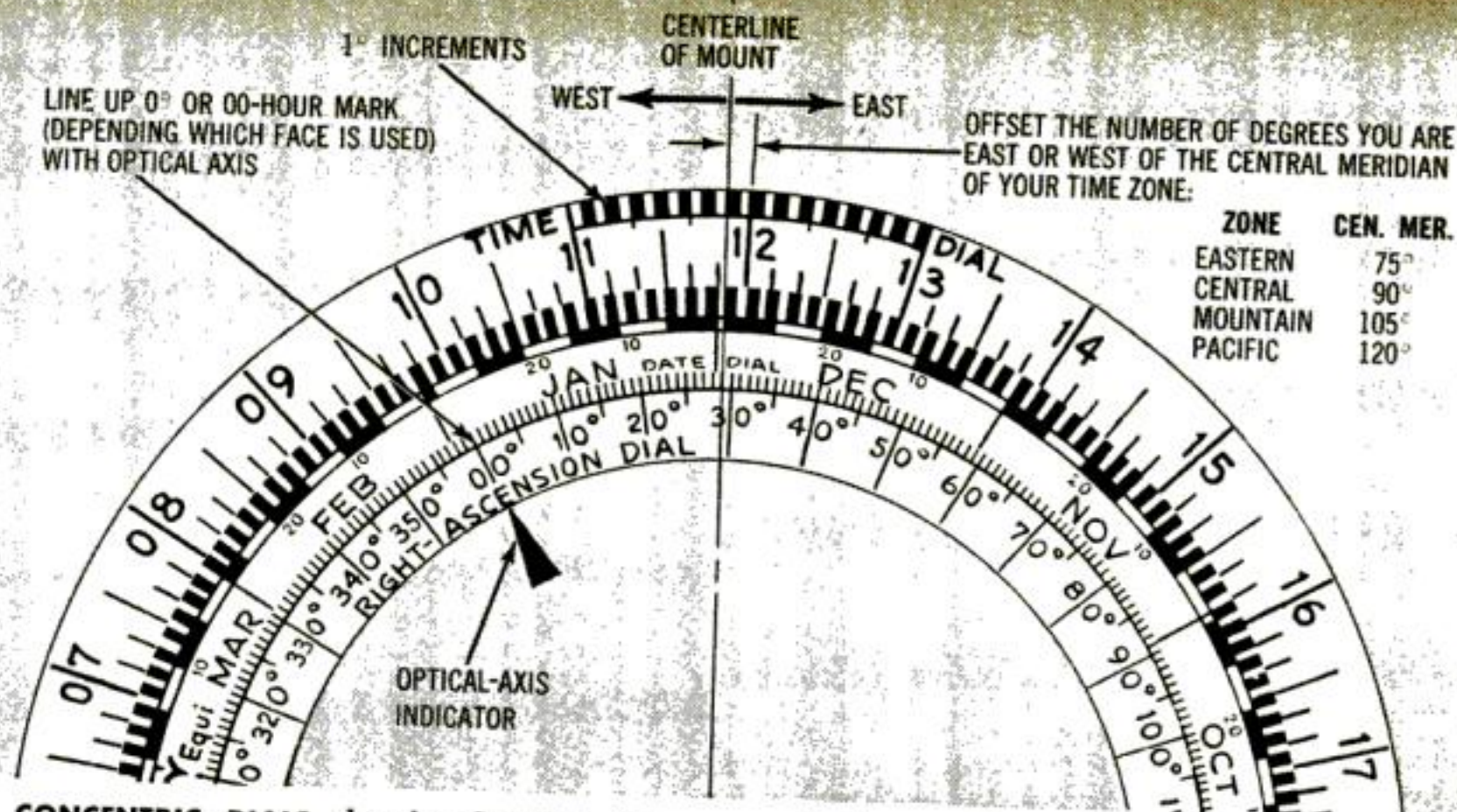
CONTINUED



**DISASSEMBLED**, the star finder breaks into five units. Clockwise, from top: mount (time-dial plate), fork (with date and right-ascension rings), eyepiece, telescope tube (assembly plans next page), and objective lens.

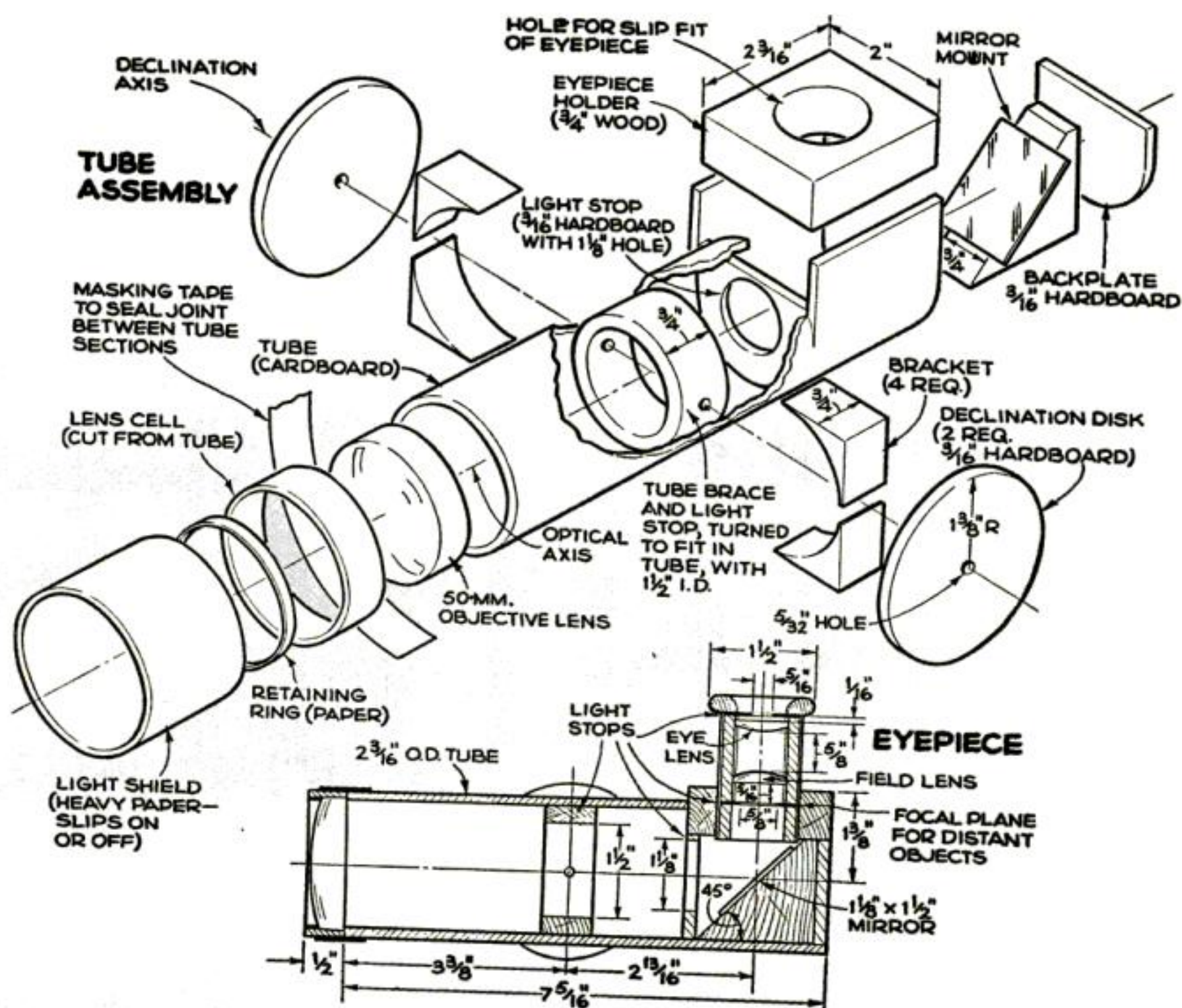




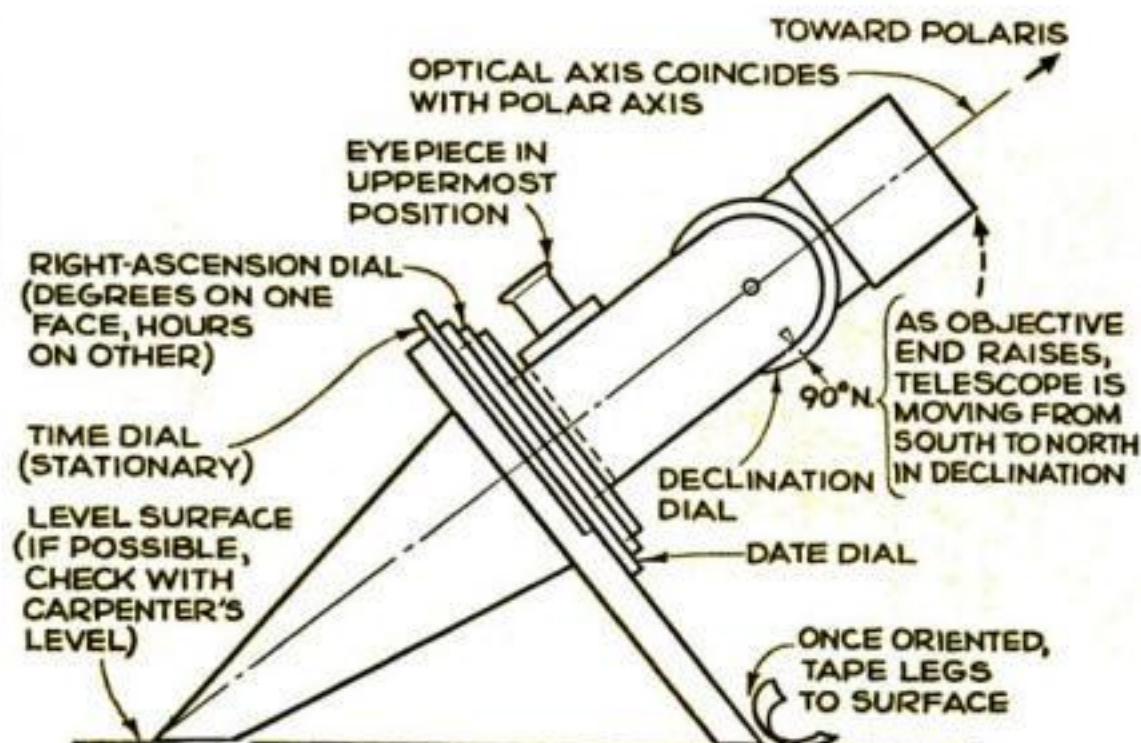


**CONCENTRIC DIALS** do the figuring for you. Glue time dial to mount with 12-hour mark offset from centerline as shown. Date ring rests

on bottom flange of fork unit, but turns independently. Declination dials are glued to the disks that flank the telescope tube (below).







**THE RIGHT-ASCENSION RING** turns with the fork, but has a dial on each face and must remain reversible. To switch dials, swing tube down into fork, remove eyepiece, slide ring up over fork, flip over, and replace.

**ORIENT THE STAR FINDER** by placing it outdoors in the position shown. Set the declination dial. Shift mount until North Star is centered in field of view. If a more precise orientation is desired, offset Polaris one degree (one third of space from center to edge of field) in the direction of the constellation Cassiopeia.

Make a trial assembly to check alignment of the optical elements. When viewed from above, the diagonal mirror should show the open front of the tube as a circle of light centered in the hole for the eyepiece. You may have to shift or trim the mount to obtain this result. Insert the eyepiece to make sure the telescope can be easily focused. Once satisfied, remove the unglued parts and paint the interior of the tube (and all parts that go in it) dull black.

The cell with the objective lens is attached with masking tape. This permits removal for cleaning.

**The fork** consists of two uprights anchored to a disk and spaced far enough apart to allow the telescope tube to fit snugly between. In assembling, run a dowel through the holes in the sides to align the declination axis at right angles to the polar axis. The unpainted slip disks are glued on last. A slight taper on the edge of the fork base and filler pieces assures a tight fit for the removable right-ascension ring.

**The mount** is of the equatorial type—

.....

**THE SIX READY-TO-CUT-OUT DIALS** are available in the PS Star Finder Kit, No. 60, 223—\$3.95 postpaid from Edmund Scientific Co., 101 E. Gloucester Pike, Barrington, N.J. This price also covers an eyepiece set, first-surface mirror, and 7 x 50 objective lens.

that is, when the telescope is oriented, its polar axis parallels the axis of the earth, making the time-dial plane parallel to the plane of the equator. Before starting construction, consult an atlas to determine your latitude to the nearest degree.

Subtract this from 90 degrees and you have the angle at which the time-dial plate must tilt from horizontal. Attach the forward leg to the time-dial plate with glue and nails; then drill the hole for the pivot screw, making sure it's perpendicular to the plate. Glue on the crescent-shaped time-dial extension, and paint the mount a bright color.

When fastening the fork to the mount and the tube to the fork, tighten the pivot screws just enough to hold the telescope on target yet allow a smooth shift to a new target. Your telescope can't function as a star finder, however, until it's equipped with the all-important dials that point the way to celestial objects. Since these dials must be accurately graduated, POPULAR SCIENCE has arranged to have full-size reproductions of all six included in a kit containing the optical elements you'll need to make your Star Finder (see note at bottom of column at left).

**Adding the dials.** The time dial does not turn. It is glued to the mount. But it must be properly related to the centerline of the mount. Go back to the map to determine your longitude to the nearest



degree. Compute the number of degrees you are east or west of the central meridian of your time zone, and position the dial as shown in photo on earlier page.

You actually need only one declination dial; the second is optional. The 0° mark must be in the plane of the optical axis. The declination indicator is located on the fork so that it points to 0° when the optical axis is parallel to the time-dial plate. This may be done by placing the mount's forward leg between two stacks of books, to bring the time-dial plate level. Sight along the top of the plate at a distant point. Center this point in the field of view, and put a temporary index marker on the fork at the dial's zero. Snip your index points from masking tape so you'll be able to adjust them after you have tried out the star finder.

**Locating a star.** Let's test the dials by setting them for Betelgeuse, the red star near one shoulder of Orion. Its right ascension is 88° and declination is +7°. Once the star finder is set up outdoors, as shown in the orientation diagram, there are only three settings to make.

1. Since this is a north (plus) declination, start at 0 and raise the front of the tube until the declination dial reads 7°.
2. Rotate the date dial until the vernal equinox is lined up with 88° (or 5 hours, 53 min.) on the right-ascension dial.
3. Rotate the entire fork (including the date dial) to line up the date with

the time shown by your watch. (The time dial uses the 24-hour-clock system and is based on standard time.)

Take a peek into the eyepiece; you should see Betelgeuse blazing away. It may not be in the exact center of your field, but it should be close to it.

Note that any object can be located using right ascension in either time or degrees. There's a direct relationship: 4 minutes of time = 1 degree of arc; 1 hour of time = 15 degrees of arc. Having both dials on the same ring merely eliminates the necessity for conversions. Use whichever corresponds to the location data you have at hand.

Occasionally, coordinates will list the sidereal hour angle in place of right ascension. This angle is simply the supplement of right ascension. When it is given in time, subtract it from 24 hours; when it's given in degrees, subtract from 360°. Now use whichever right-ascension dial is appropriate.

Theoretically, you should be able to see any object of tenth magnitude or brighter. Many Messier objects (identified by a number preceded by an "M") are within reach of this instrument. They'll appear as milky patches of light. Very faint objects may have to be located by using nearby stars as reference. An important thing to remember: north and south appear correctly oriented, but east and west are reversed. ■ ■

## Your Guide to the Night Sky

To locate a specific star, you must know its coordinates—its right ascension (R.A.) and declination (Decl.) These coordinates

can be obtained from a star chart or observer's manual. As a starter, you can use this sample list:

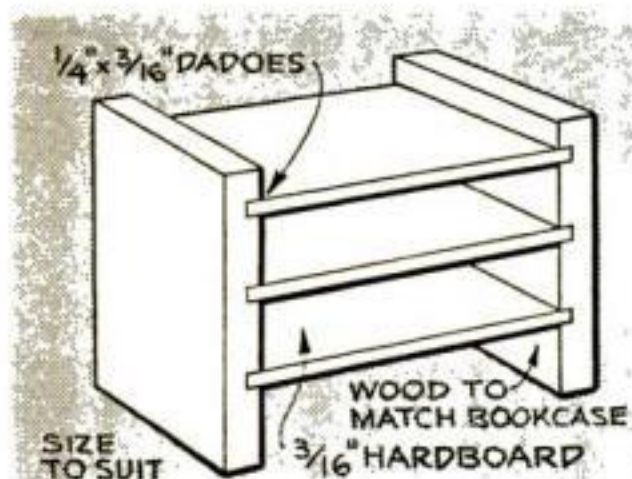
NAME	R. A.	DECL.	NUMBER	R. A.	DECL.
<b>THE BRIGHTEST STARS</b>			<b>OPEN CLUSTERS</b>		
ALDEBARAN	4h 34m (68°)	+16°	M11	18h 48m	- 6°
RIGEL	5 13 (78°)	- 8°	M24	18 16	-18°
CAPELLA	5 14 (78°)	+46°	M34	2 39	+43° Double Cluster
BETELGEUSE	5 53 (88°)	+ 7°	M44	8 38	+20° Beehive
SIRIUS	6 43 (101°)	-17°	M45	3 45	+24° Pleiades
PROCYON	7 37 (114°)	+ 5°	<b>GLOBULAR CLUSTERS</b>		
POLLUX	7 43 (116°)	+28°	M13	16h 40M	+37°
REGULUS	10 6 (151°)	+12°	M22	18 34	-24°
SPICA	13 23 (201°)	-11°	<b>NEBULAE</b>		
ARCTURUS	14 14 (214°)	+19°	M8	18h 1m	-24° Lagoon Nebula
ANTARES	16 27 (247°)	-26°	M42	5 33	- 5°
VEGA	18 36 (279°)	+39°	<b>EXTERNAL GALAXY</b>		
ALTAIR	19 49 (297°)	+ 8°	M31	0h 41m	+41° Spiral Galaxy
DENEK	20 40 (310°)	+45°			
FOMALHAUT	22 55 (344°)	-30°			

**Notes:** Not all these objects are above the horizon throughout the year. For locations of planets consult



## Short Cuts and Tips

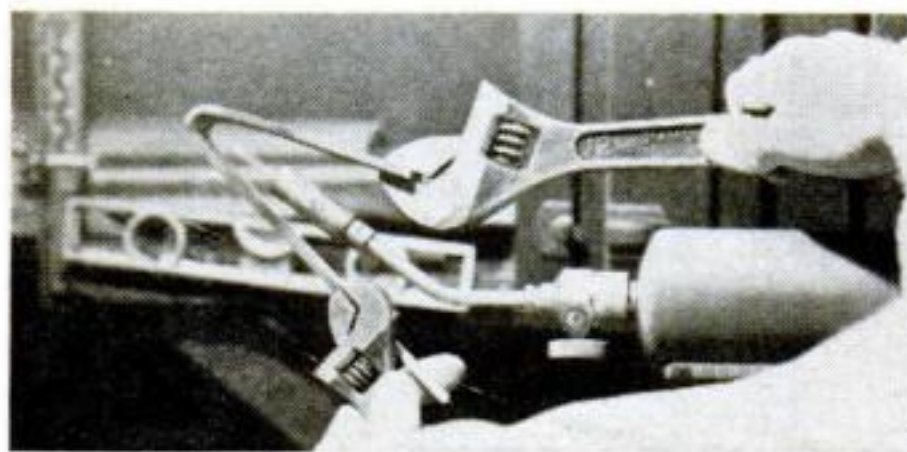
FROM PS READERS



### Bookcase Stationery File

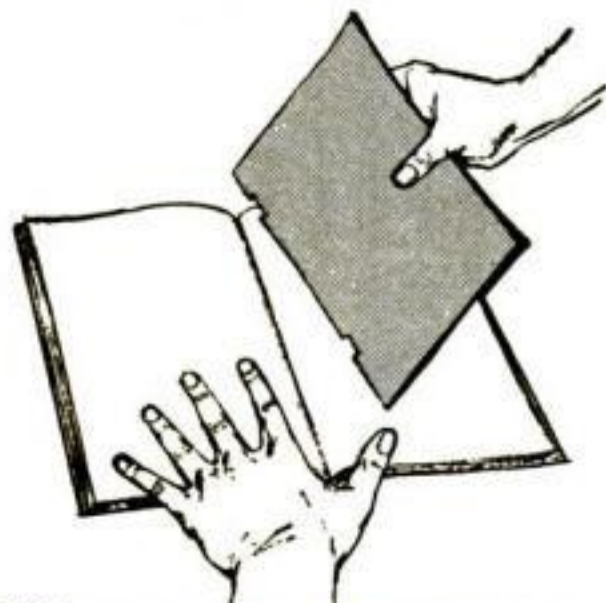
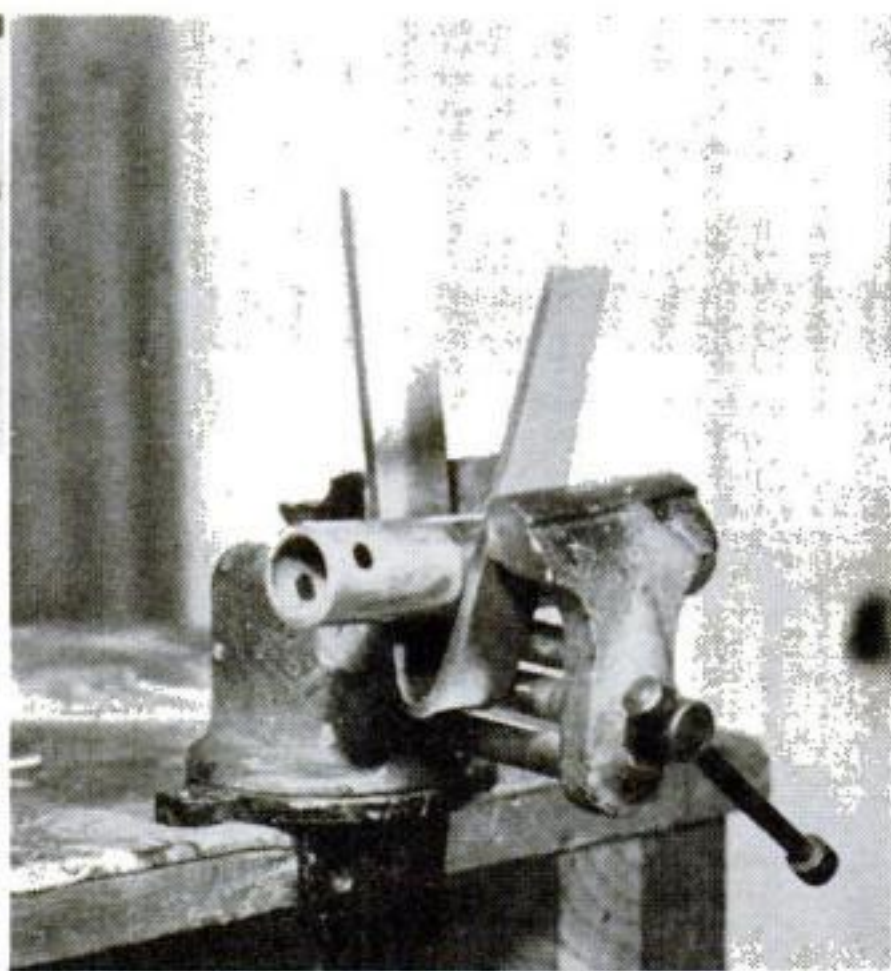
A CUBBYHOLE unit inserted in a bookcase near a writing table will keep your letter paper, envelopes, stamps, and mail-

ing labels in order. Dadoes for the hardboard shelves are table-saw kerfs. Glue the shelves in place after finishing the uprights to match the bookcase.—*Harvey Versteeg, Inkster, Mich.*



### Pipe Vise from an Old File

CLAMP crescent wrenches on both ends of a discarded file, and hold it in the flame of a propane torch. When the center is red hot, bend to a V shape. Place the cooled file in a vise, as shown, and wedge pipe or heavy tubing in the V. The file is resilient enough to close snugly on the pipe when the vise is tightened.—*E. M. Harman, North Hollywood, Calif.*




## To remove this SAVE-IT SECTION...

... Pinch the eight pages together and lift firmly, tearing them free from one staple and then the other. When the section is free from the magazine, staple it along the back fold and crease a strip of tape over the spots torn out by the staples.

**Next Month:** The Fine Points of Making Chairs—another useful Save-It Section.





# The Fine Points of Table Making

By R. J. De Cristoforo

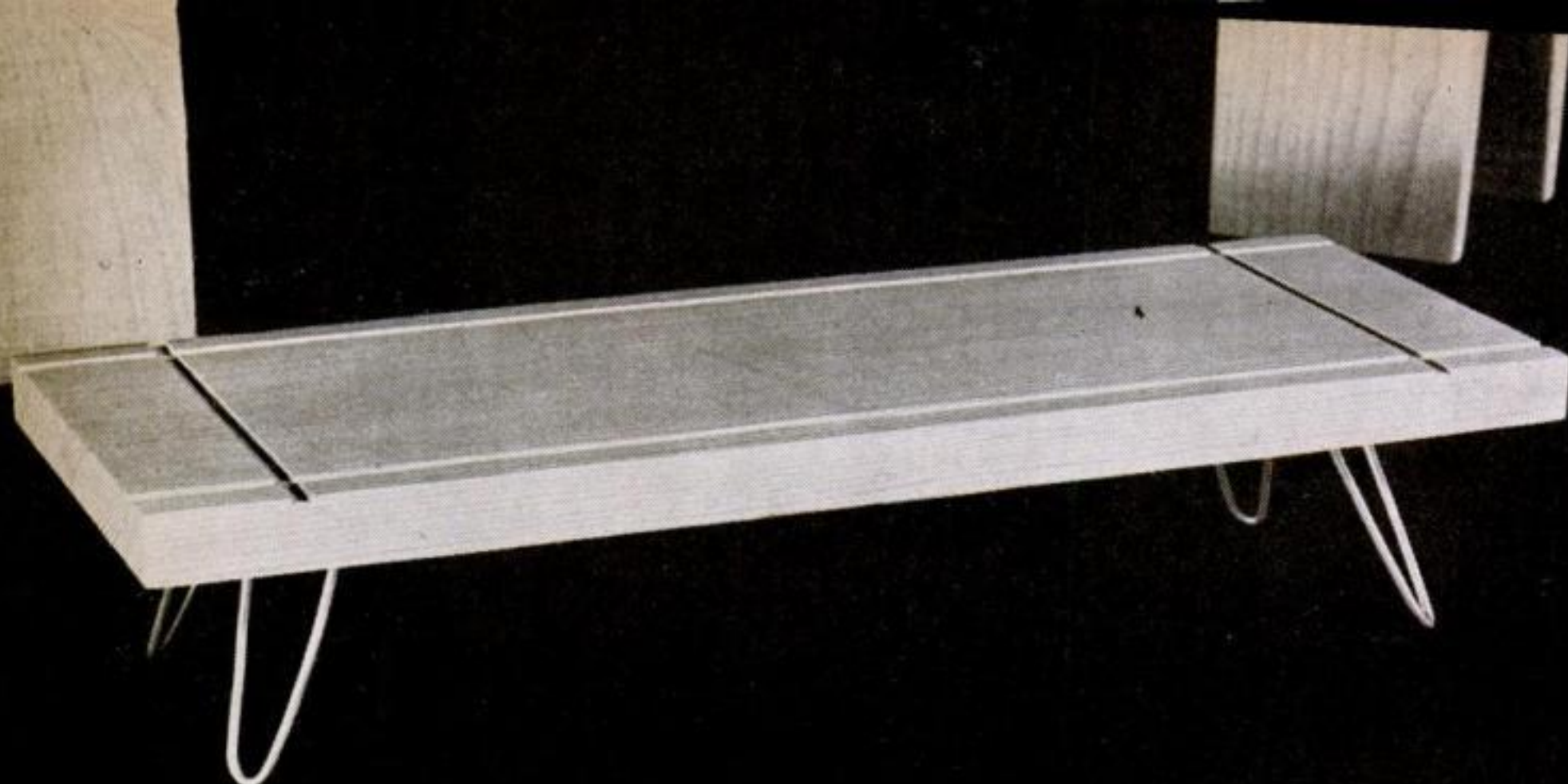
**M**AKE one table and you've made them all. Most times, only size and minor details distinguish one from another. Play tables, dining tables, coffee tables, end tables—all are pretty simple unless you choose to make them tough. Any slab top with legs can be called a table, but some few details make the difference between a professional job and one you'd like to burn a month later.

Table size is not arbitrary. This is one styling job where function almost dictates proportion. So that a person can sit and eat comfortably, dining-table height must be such that he can be well above it yet have adequate knee room. The top must be sized to give elbow room for each person the table is to accommodate, plus space for dishes and silver.



**BE SURE IT'S BIG ENOUGH:** Minimum width for comfortably seating four at a square table is 32"; 36" is better. For round tables, allow a 36" diameter for four persons and 48" for six.





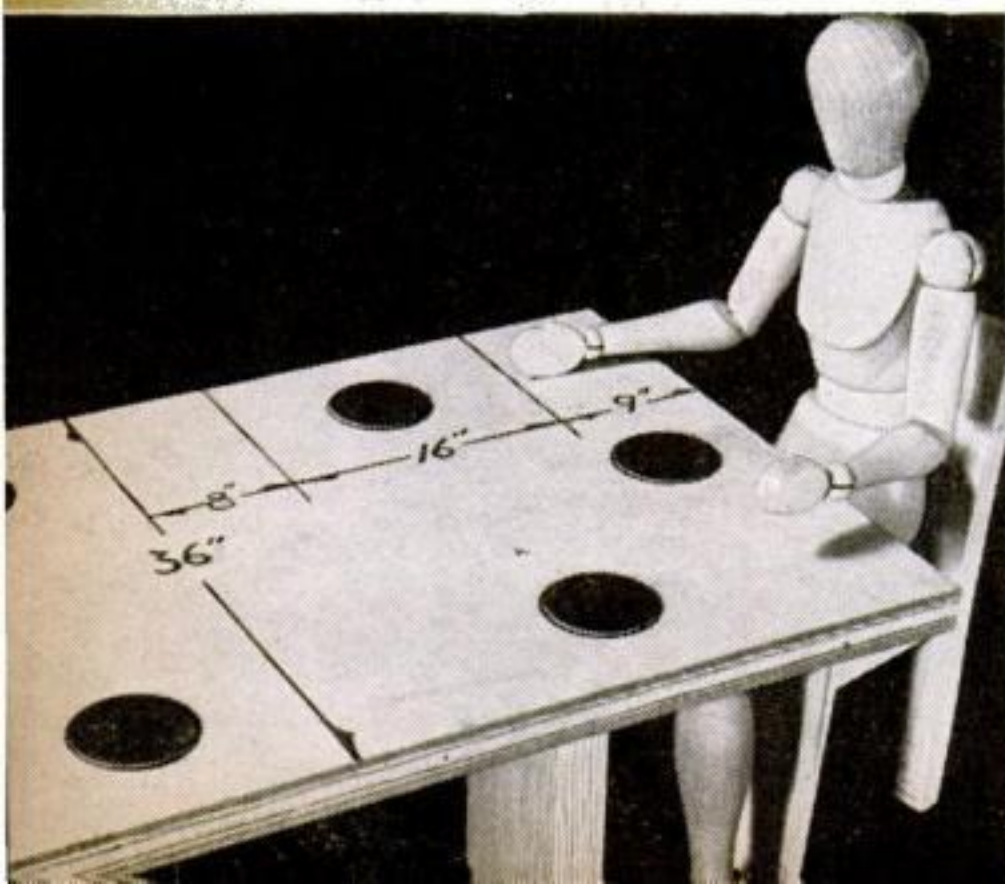
## Tricks of the trade for making better tops

**EASIEST TABLE** is made by attaching store-bought metal legs to a slab top. Slab can be a flush door or plywood built up at the edges.

### Some recommended table dimensions

STYLE	HEIGHT	WIDTH	LENGTH
DINING	29"	36"	56"-82"
BREAKFAST	29"	32" 36"	30"-45" 48"-58"
SNACK	18"-24"	14"	16"-20"
END	22"	15"	28"
COFFEE	14"-18"	17" 20" 32" 38"	36" 42" 66" 76"
LAMP	22"-27"	15"-20"	15"-30"

**FOLLOW BASIC SPACING** below in designing any table. Allowing 16" per place with 8" in between, a table for eight should be 36"-by-82".



It's entirely possible to break these rules and come up with a proportion more pleasing to a discriminating eye. But don't. Tables are mostly for using, and if you want to rub knees, build a love seat. Human proportions must play a basic part in the planning.

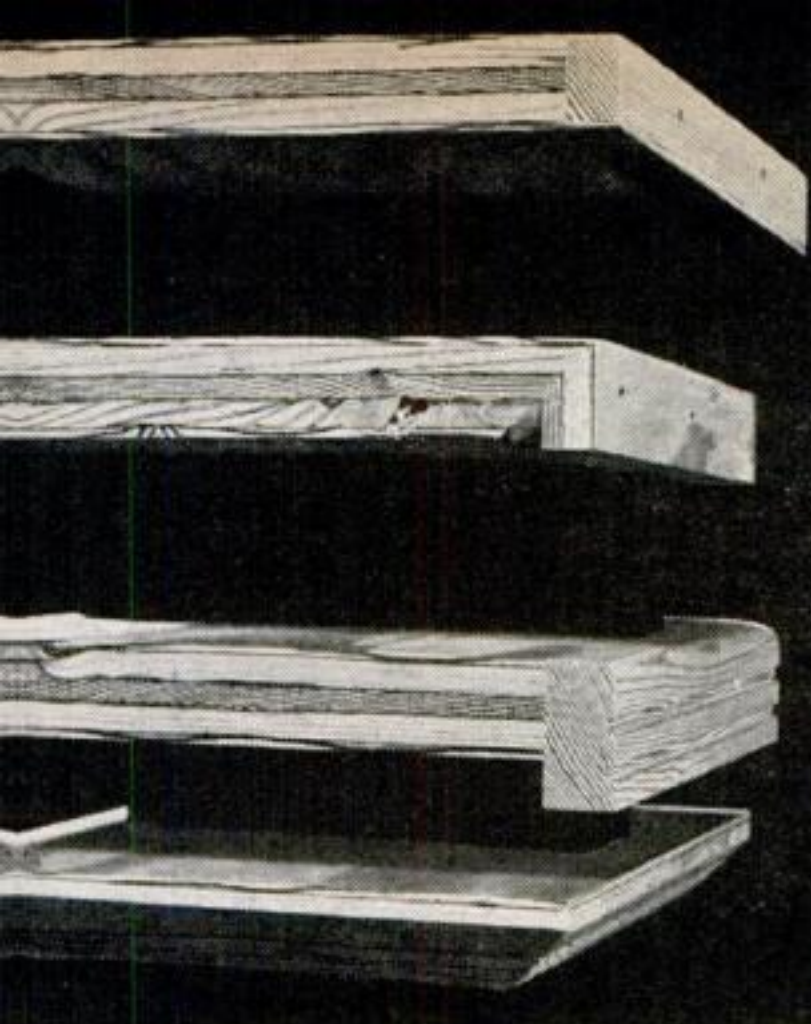
A *flush door* is a made-to-order table top. Add the right-length legs and you have either a coffee or dining table. Screw wrought-iron or other ready-made legs into place—and presto, a table! Ready-made legs include some beautifully turned, brass-ferruled ones that are almost cheaper to buy than to make. And handsome all-brass legs are now on the market.

Doors are either hollow-core or solid. The hollow door is much lighter (by a good 50 percent). Be sure to attach legs to the interior framing. To get more freedom in leg placement, secure the legs first to a cleat that is almost equal to the width of the door. Then screw the cleat to the frame.

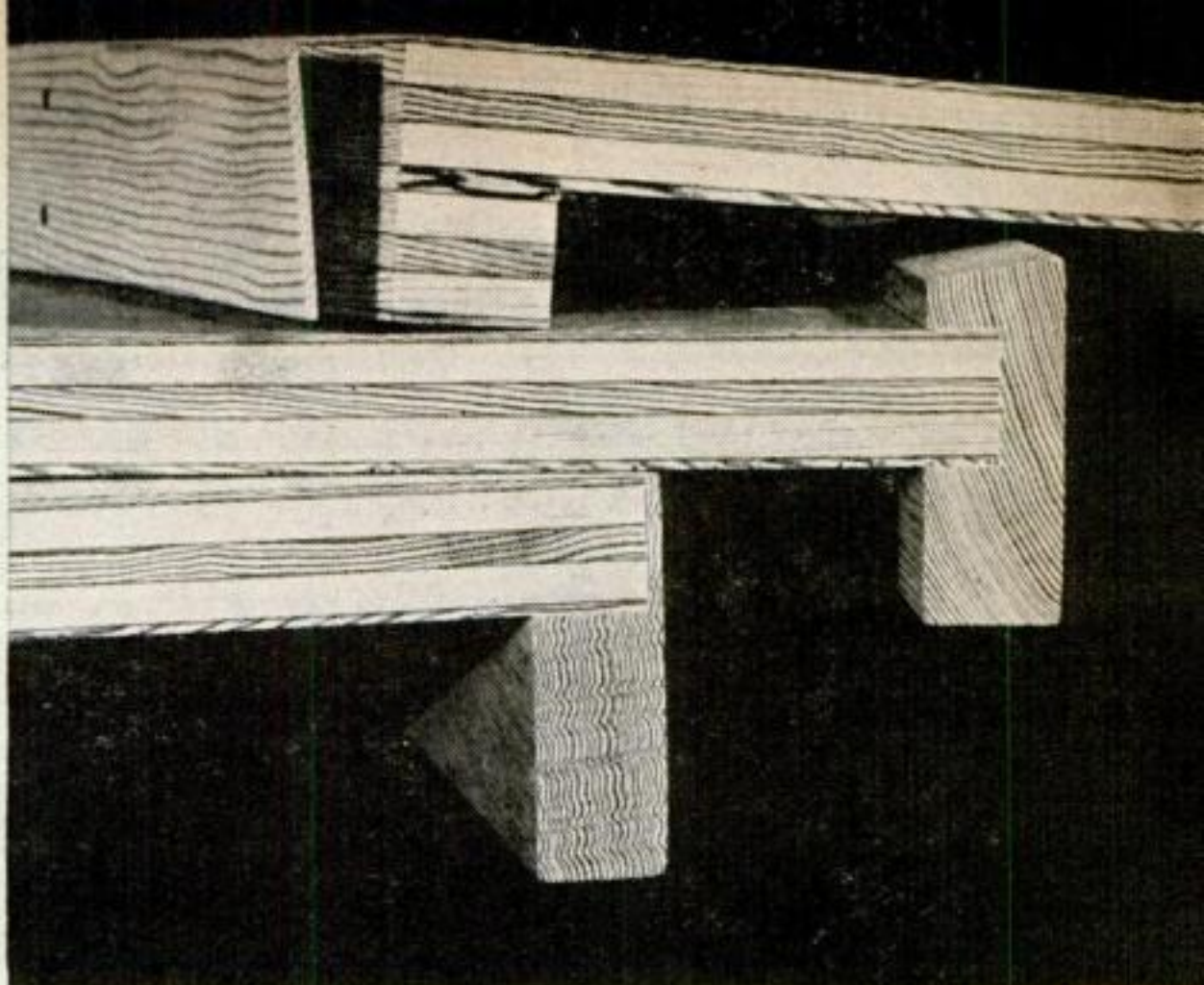
Plywood is great as a table-top material because 4'-by-8' panels provide latitude in table size. You can easily conceal plywood edges with self-adhesive wood tape or with strips you cut.

You can also bulk up the edge with molding or by nailing and gluing on special strips of your own design.





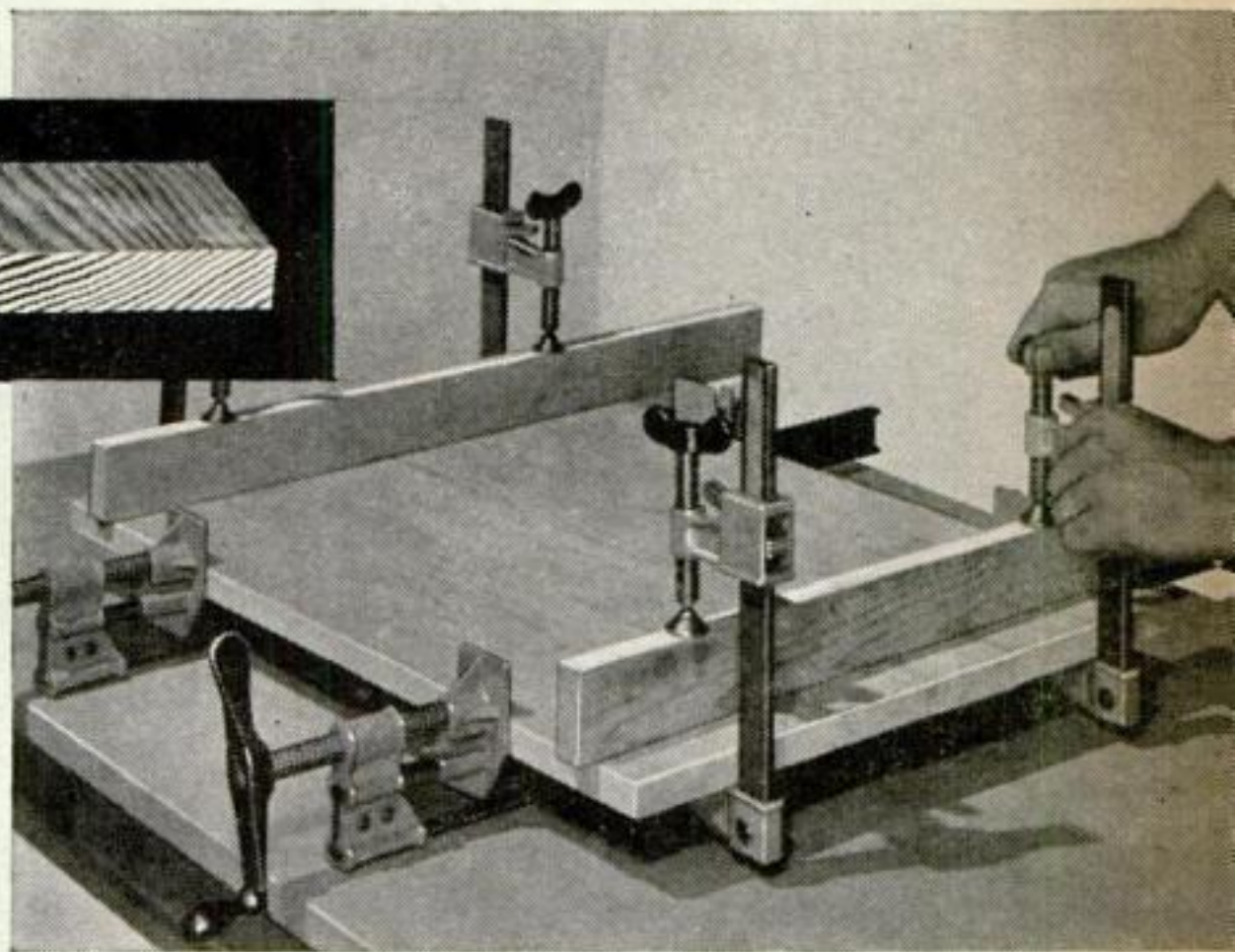
**TO HIDE PLYWOOD EDGES,** try one of these (top to bottom): Add solid strips, miter edge by gluing on inverted strips sawed from edge, add molding, or bevel edge on the underside.



**TO THICKEN AN EDGE,** add dummy strip faced with thin band (top), raised lip dadoed on (center), or rabbeted skirt (bottom). Avoid the lip-type edge, however, on eating tables.

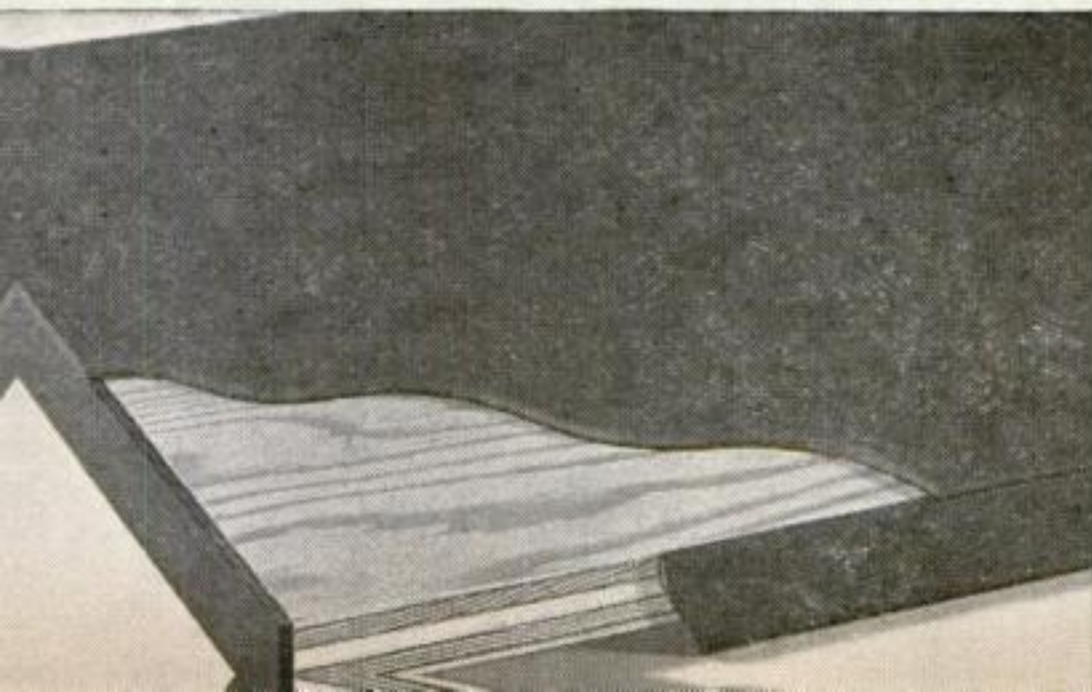


**SECRET OF GOOD GLUED-UP TOP** is use of many narrow strips instead of a few wide ones, and plenty of clamps. Cross-cleats under clamps at right keep strips from buckling under pressure. To prevent warp, alternate direction of annual rings, as shown in strips above.



**PLYWOOD MAKES A GOOD CORE** for plastic-laminate tops. Attach edge strips first, then cut top sheet to overlap them. Use contact cement.

**CERAMIC TILES** make an eye-catching top, can be put on with contact cement. Wood edging, flush with tiles, prevents bathroom look.





## Points to remember about table legs

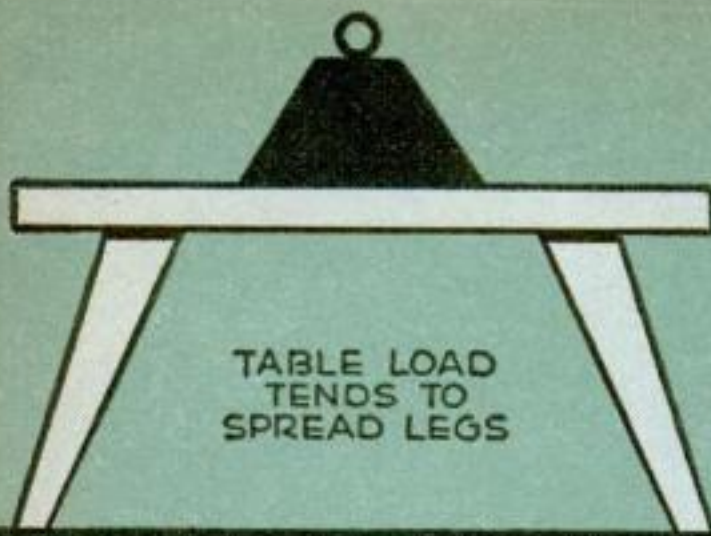


TABLE LOAD  
TENDS TO  
SPREAD LEGS



NO-SLANT  
LEG IS  
STRONGEST



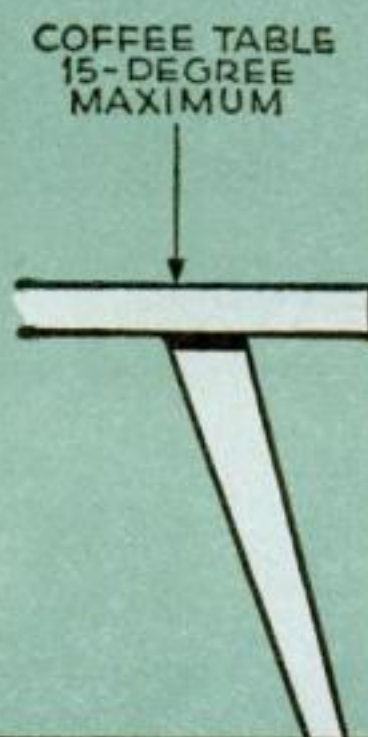
MORE SLANT,  
LESS  
STRENGTH



DINING TABLE  
5-DEGREE  
MAXIMUM



END TABLE  
10-DEGREE  
MAXIMUM



COFFEE TABLE  
15-DEGREE  
MAXIMUM

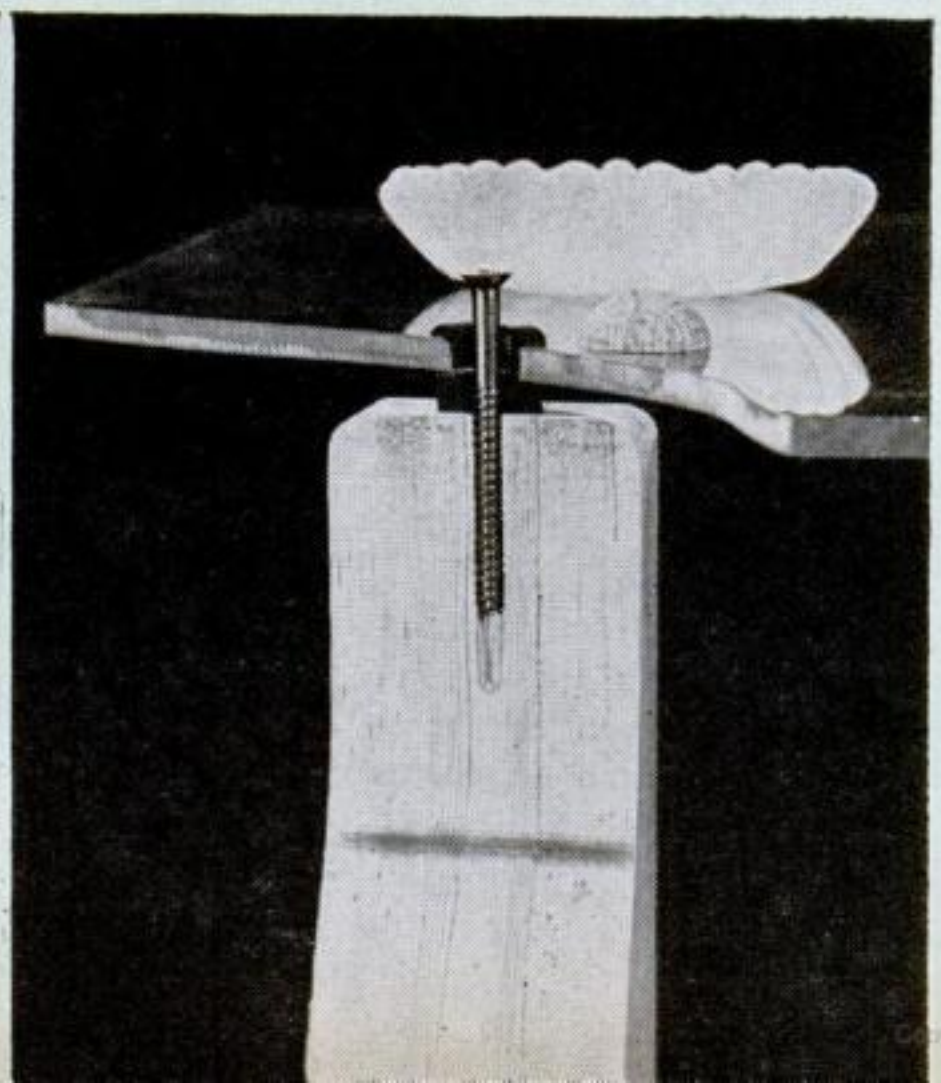
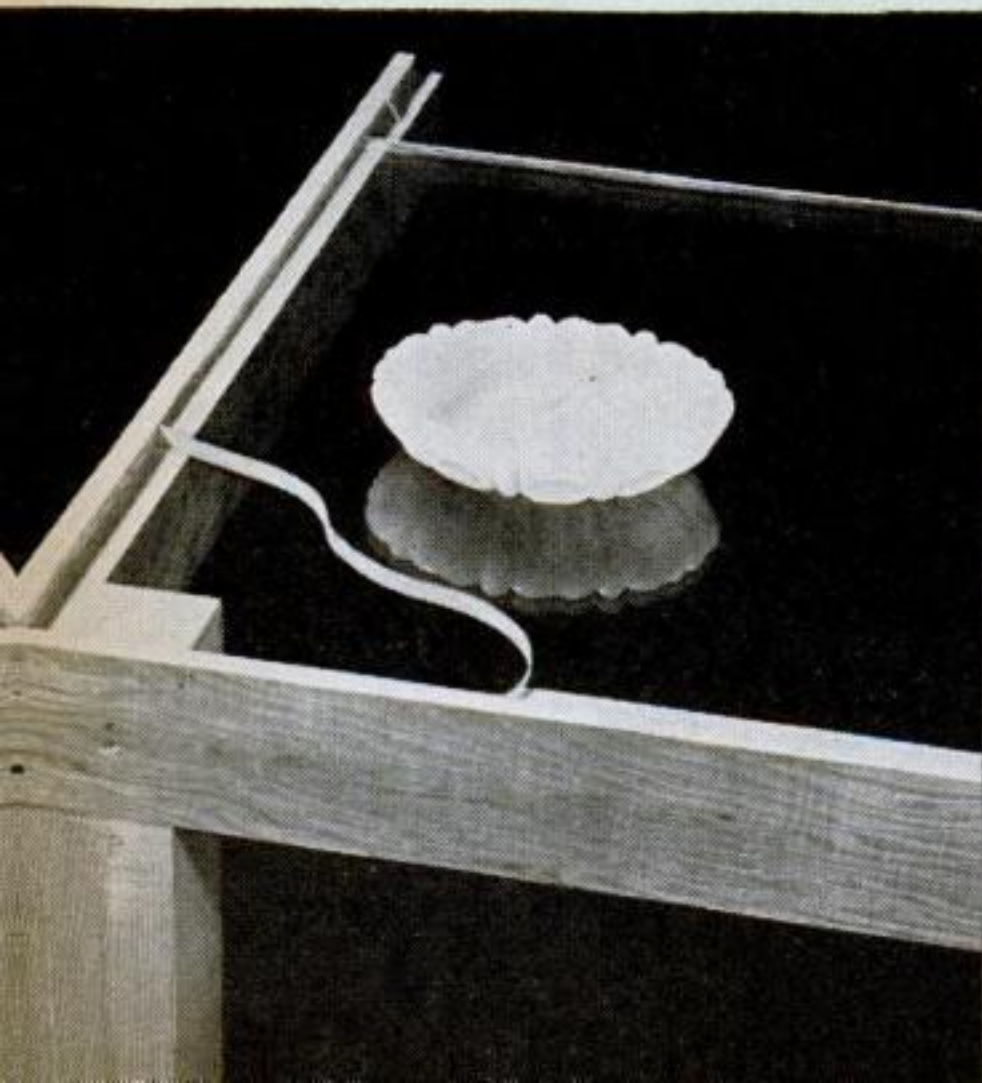
ALWAYS  
KEEP LEGS  
IN TABLE  
BOUNDARY  
UNLESS  
YOU WISH  
TO TRIP  
SOMEONE



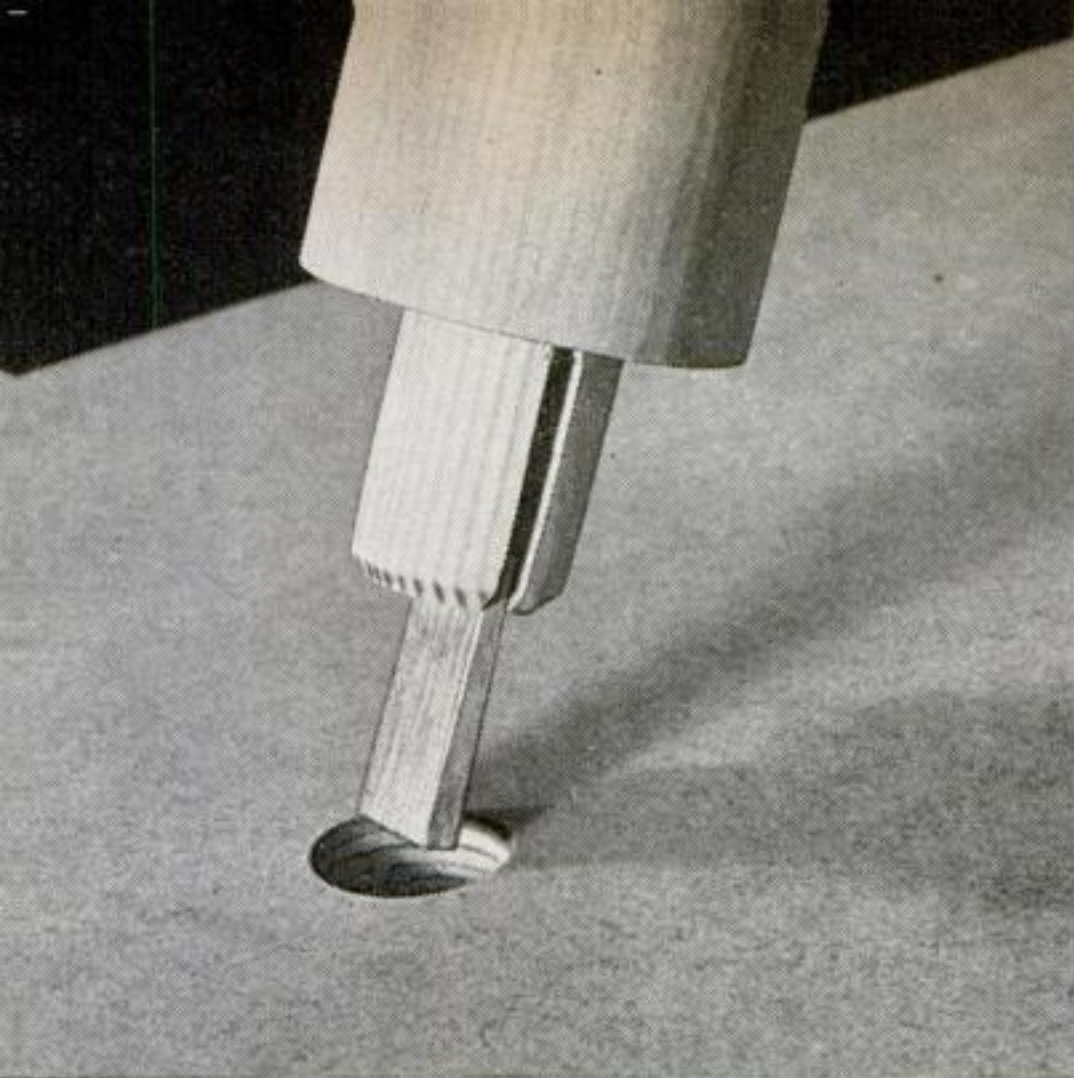
## When you want a glass top

**SAFEST AND EASIEST WAY** to mount a glass top is to set it in a rabbeted wood frame. Here, legs are notched for mitered side rails.

**LEGS CAN BE SCREWED TO GLASS** by using rubber grommets in holes this way. Cement small wood buttons on top to hide grommet and screw.



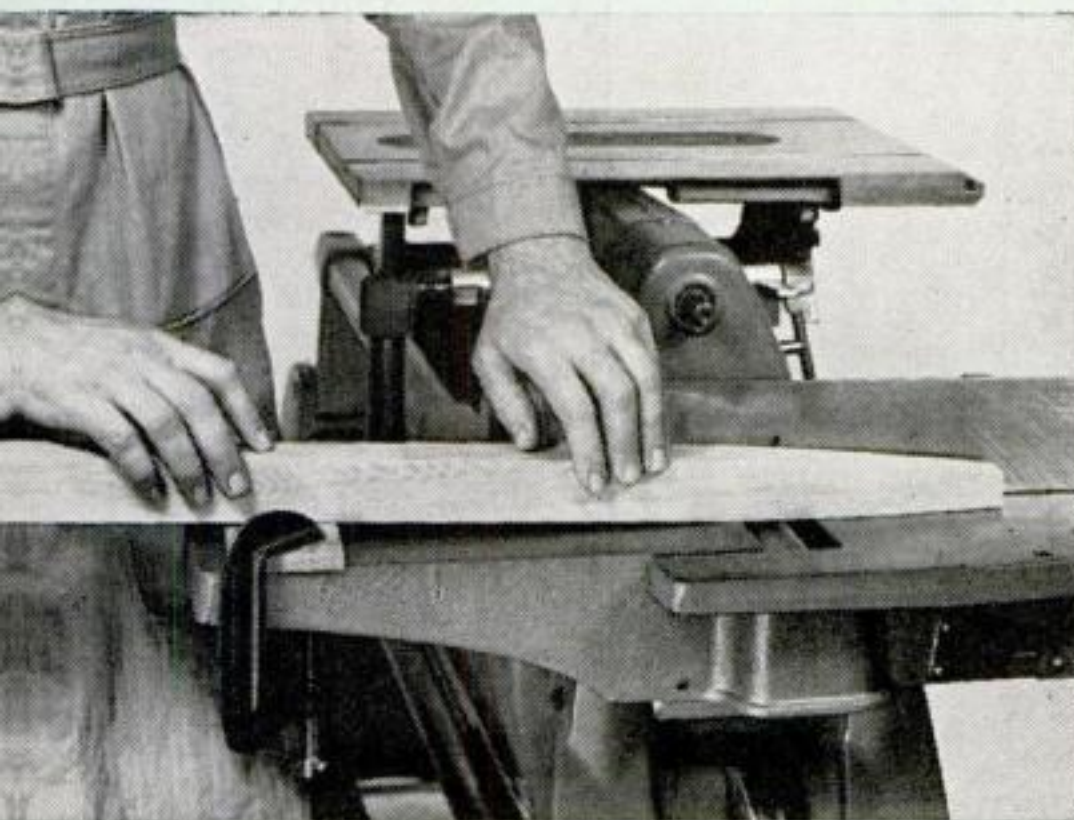




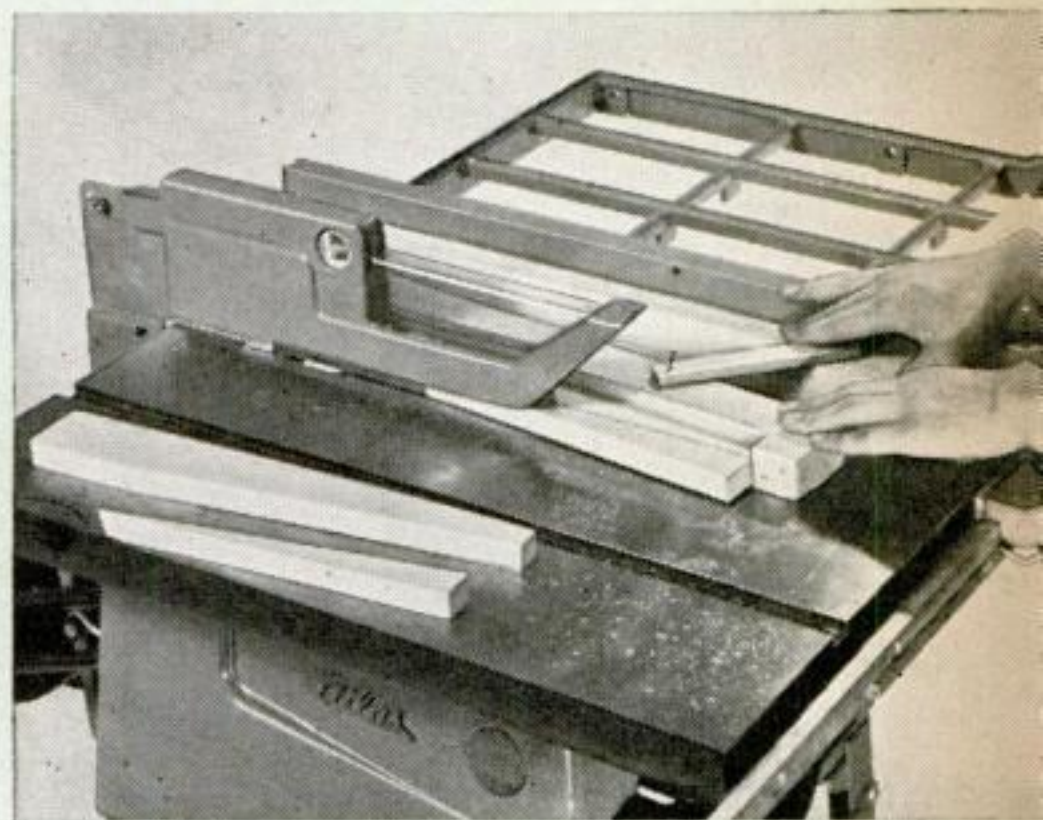
**USE DOWEL-LOCKING WEDGE** when attaching legs directly to a slab top. Driving leg in causes wedge to spread dowel tightly in the hole.



**ROUND LEGS CAN BE TURNED** on a lathe to any desired shape. It's best to make a profile template first so that all legs will be identical.



**LEGS CAN BE TAPERED** in two ways. Above, stock is shaped on a jointer by resting end on wood block to provide correct taper angle. At right,



legs are cut on a table saw with a taper jig—simply a scrap board with a slanted notch in it to hold the work at the taper angle.

One of the most satisfactory tables is one with a solid top made by gluing up narrow boards. A common error is using boards that are too wide. This will make a slab quicker, but the boards will surely warp.

Best bet is to rip available stock into 4" widths and assemble them so that the annual rings on the ends of adjoining boards point in different directions. The edge-to-edge joint doesn't have to be fancy; the dowel joint is strong and concealed. Tongue-and-groove joints are great

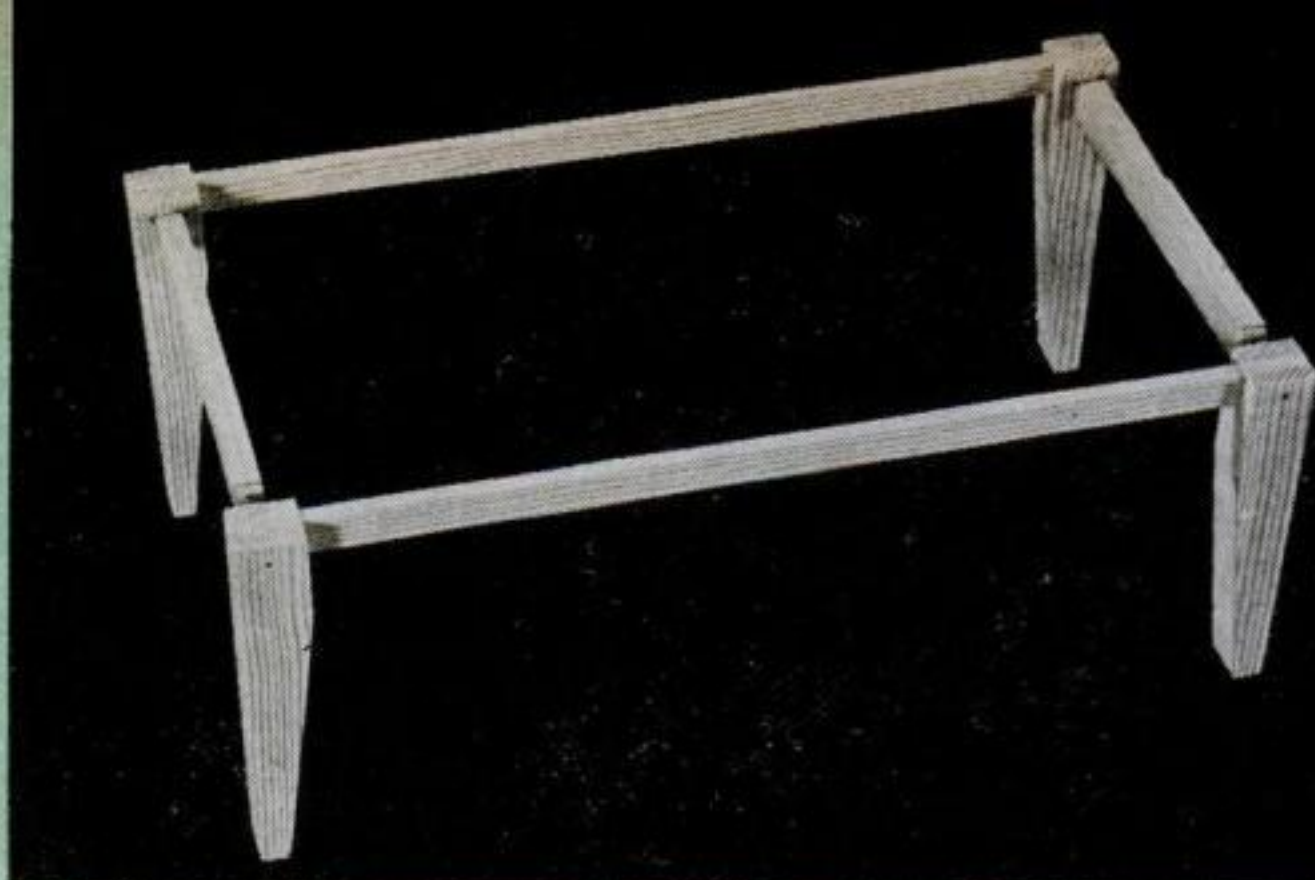
but offer one disadvantage—they can be seen at the stock ends.

Plywood can be used as a core for a laminated table top. Micarta, Masonite, Marlite, Formica, plus many types of floor-covering materials can be cemented to the plywood. Secret here is to cut both plywood and covering slightly oversize. Trim both after the material has been applied. Mosaic and ceramic tile-top tables can also use plywood for a sturdy base.

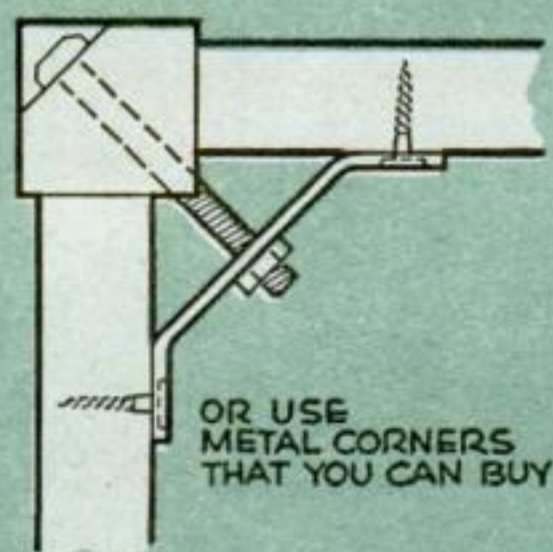
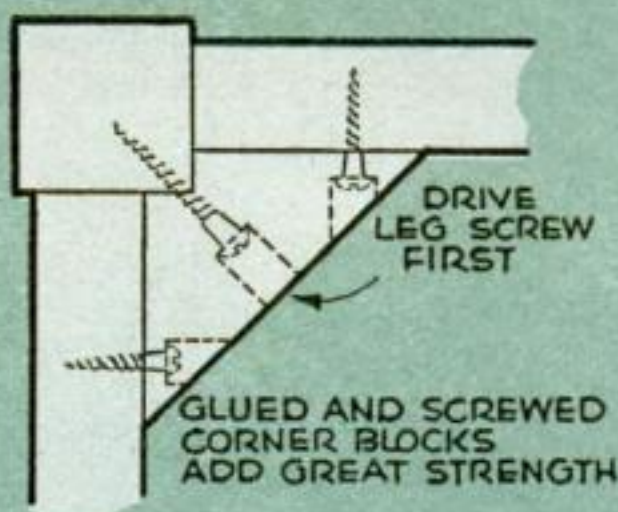
*Slat tops* are used mostly outdoors.



# Leg-and-rail assembly gives strongest underpinning



**BASIC LEG-AND-RAIL FRAME** is the sturdiest you can build. It may not be required on low tables, but is a wise choice for high ones.



The spacing between boards lets rain through. If you want a glass top, decide beforehand that you will have the glass cut and polished for you. This is not a job for the average home shop. Glass tops can be inset in frames cut to fit or you can screw-attach individual legs through holes in the glass.

The sturdiness of a table and its life span depend on the way the legs are attached. Structurally, it's here that the table is constantly tested. Every time you move or use a table, the leg-to-top joint gets the strain. But this isn't an insurmountable problem. Just remember that the top is a span that must support weight. Biggest safety factor is in minimum slant on the legs. The closer to zero you keep the slant, the stronger the assembly.

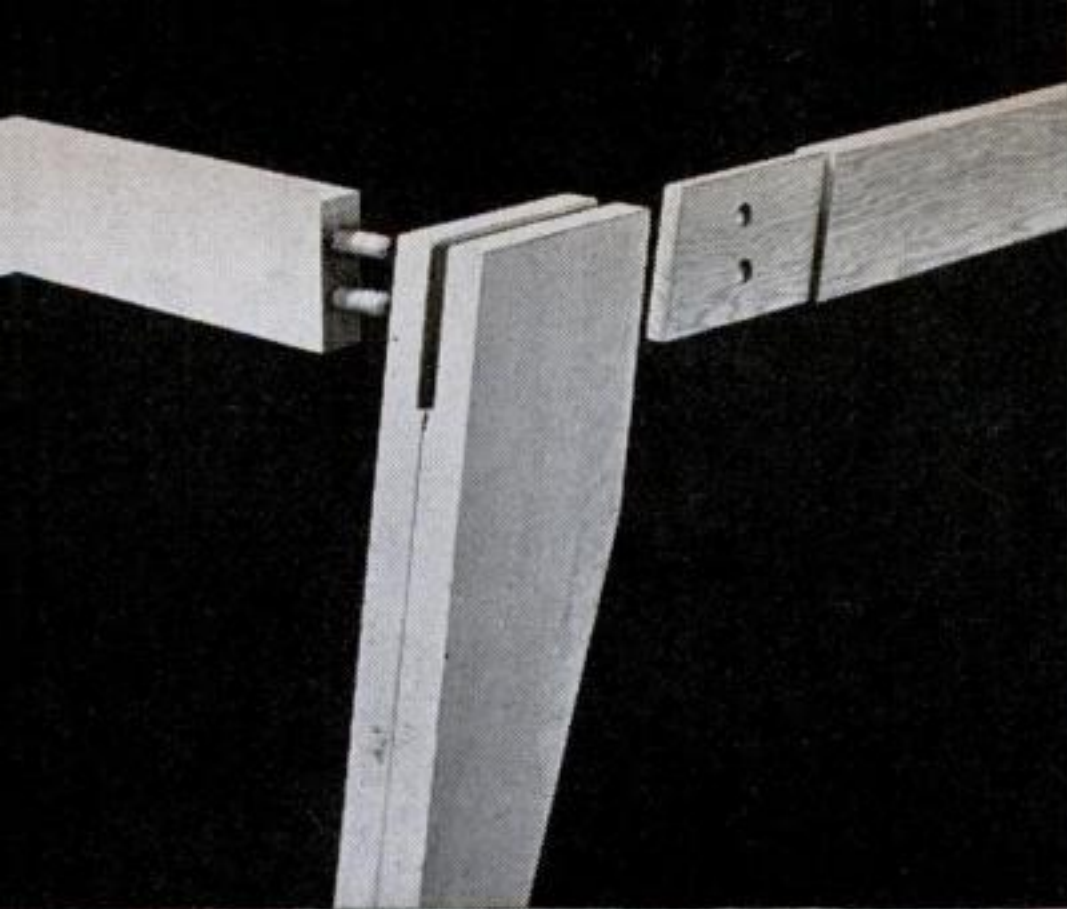
Strongest method of assembling a table is the common leg-and-rail design. This is an open frame with the top attached. The frame joint can be reinforced by using corner blocks. These are most likely to be needed in higher tables (dining as opposed to coffee) and in designs where the legs slant in two directions.

One trick is to cut the corner block so it fits snugly against the leg but not against the rails. If you screw to the leg first and then the rails, you'll be pulling everything in nice and tight.

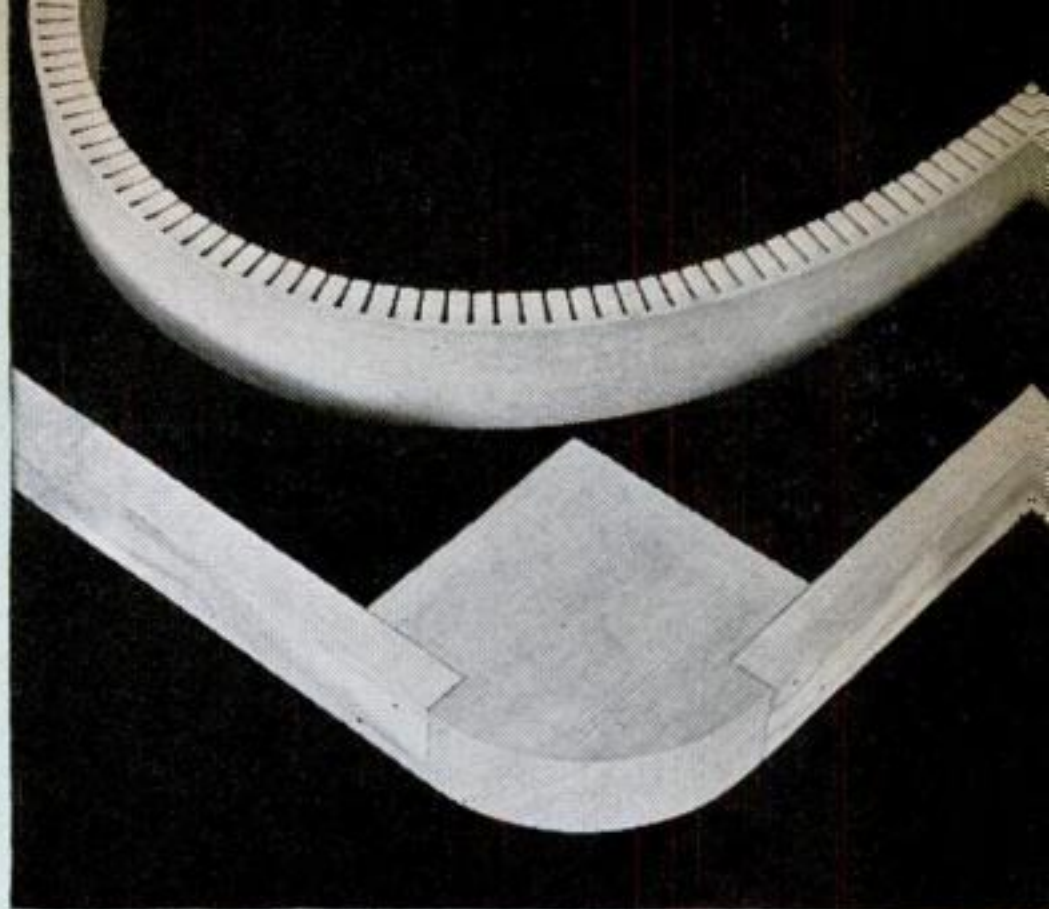
**The dowel joint** is good for attaching legs to rails. A mortise-tenon is often used but it's a lot of trouble for just some extra glue surface.

Whichever joint you use, set the rail back from the edge of the leg. A hairline joint crack, which will often develop at

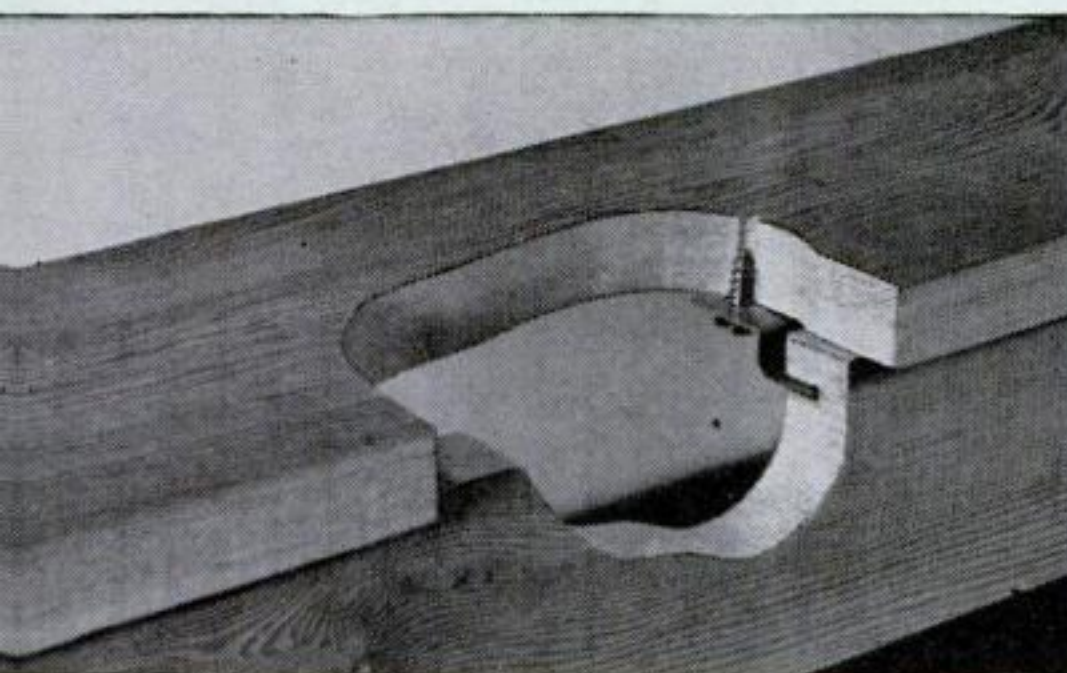




**FOR HIGH STRENGTH**, dowels in one rail lock into holes in tenon on other rail. Drill holes slightly "off" so dowels pull rail up snugly.



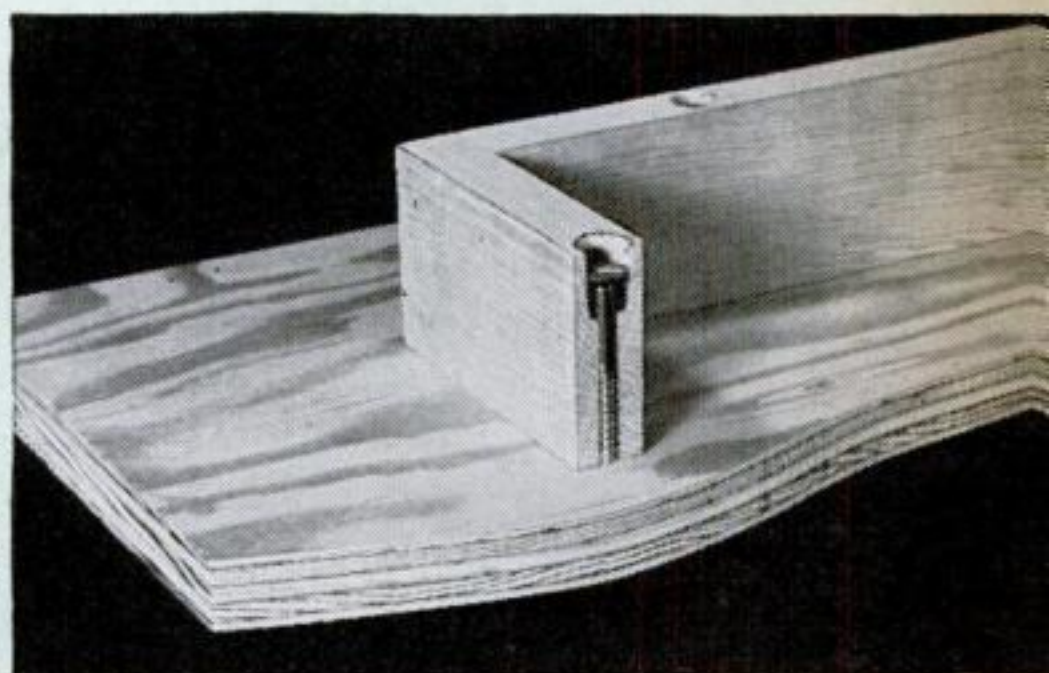
**TWO WAYS TO TURN CORNER** with rails. Kerfing method at top is often used to make circular rails or smoothly curving table aprons.



**HERE'S THE PRO'S WAY** of attaching a solid top. Metal clips in grooves allow top to expand and contract without bursting the frame.

this point, won't be noticeable then.

Attaching legs directly to the table top is never as good as the leg-rail technique, but for smaller and lower tables it is satisfactory. Ready-made legs are



**SCREWING RAILS** directly to the top is risky on uncured wood, but is a strong and simple method if you're sure top has stabilized.

often equipped with hardware that gives maximum attachment strength.

If you make legs, you can increase strength by assembling the legs first to cross-cleats and then attaching the cleats

CONTINUED

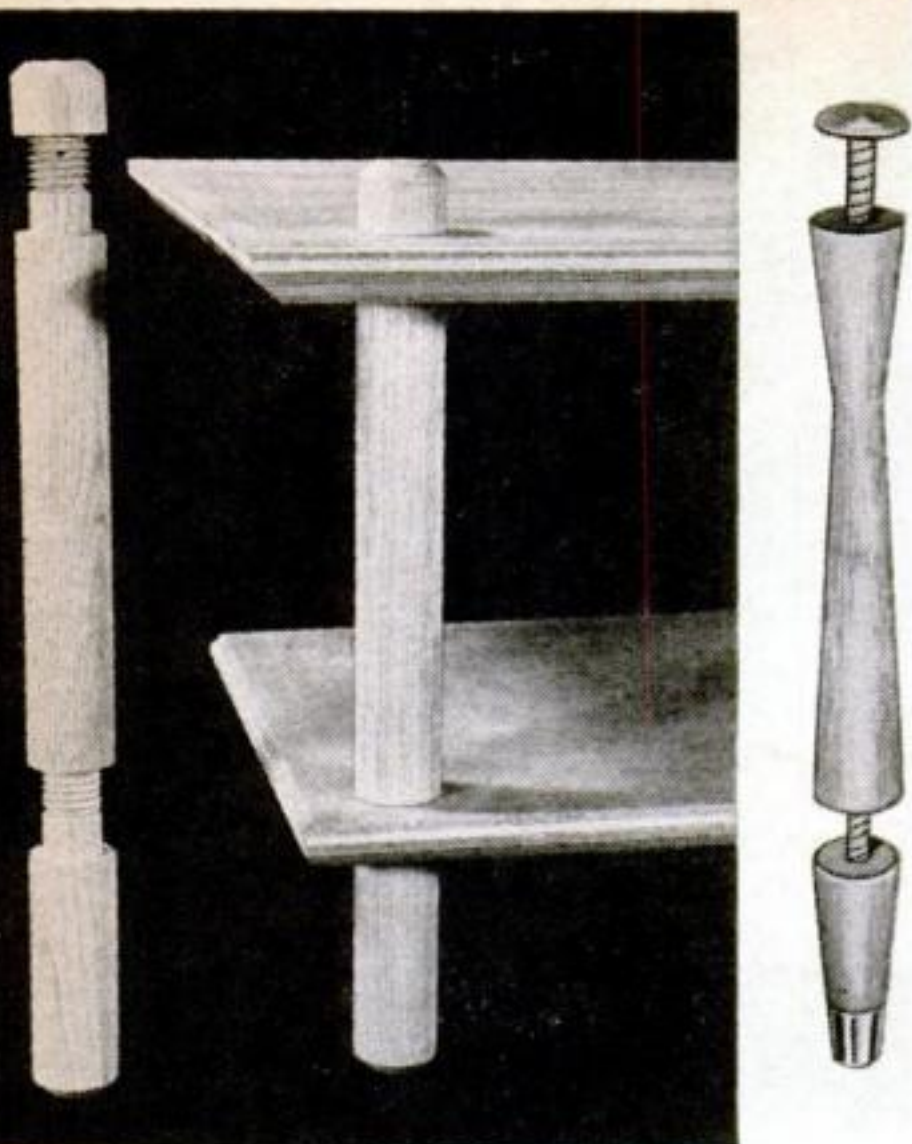
## An easy way to make an outdoor table

**SLAT-TOP TABLE** lets rain drain through, is merely spaced planks held by two cross-cleats. Scraps of  $\frac{1}{4}$ " or  $\frac{3}{8}$ " plywood inserted between

planks as you fasten them insure uniform spacing. X-shaped legs are strong, can be half-lapped where they cross for a trim look.



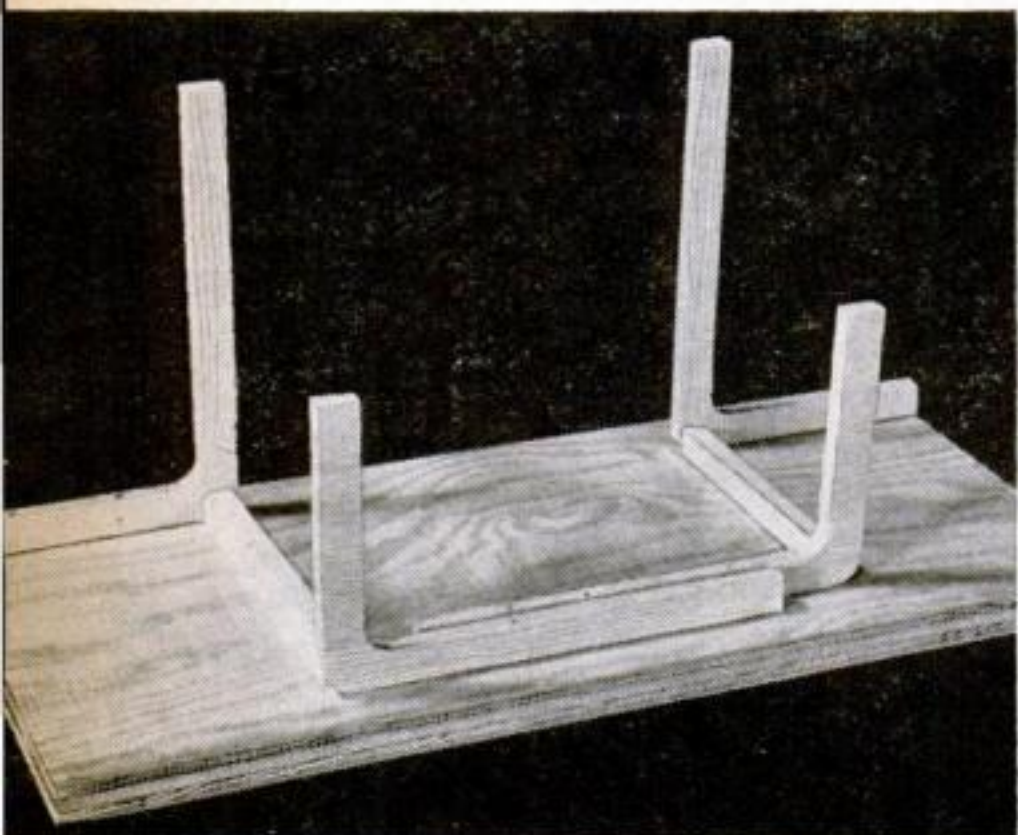




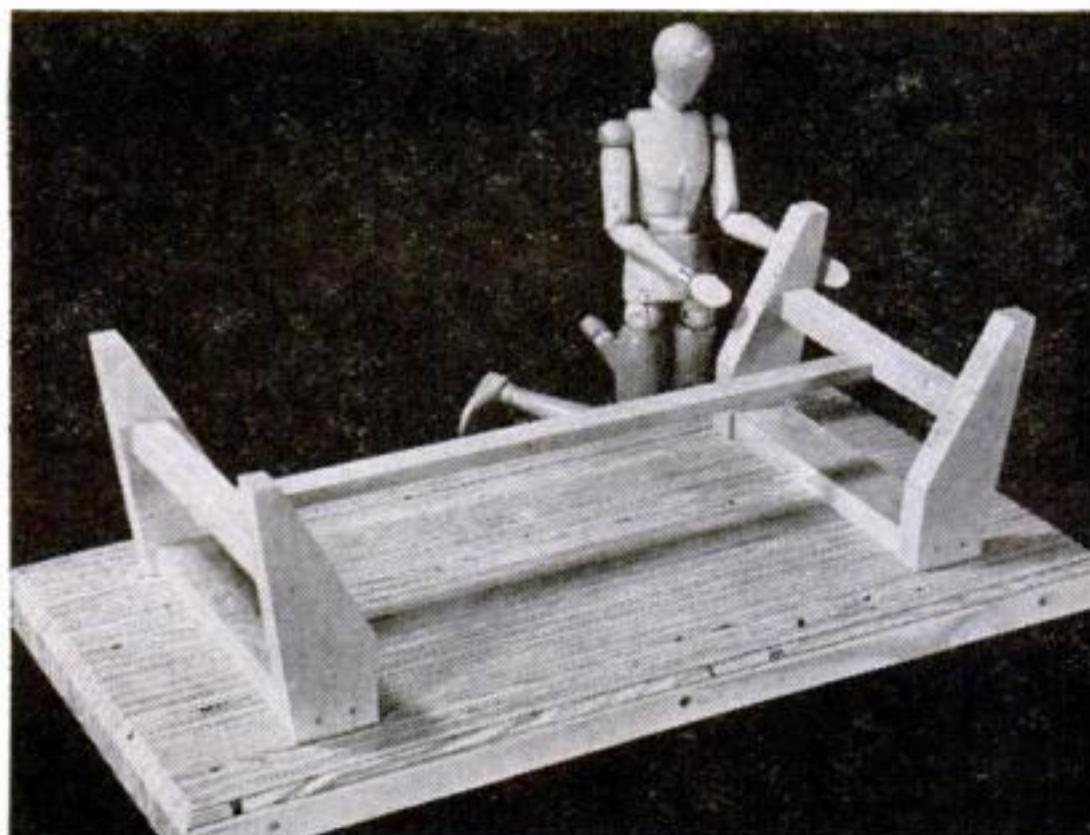
## You can use many ready-made items

**STORE-BOUGHT LEGS** make attractive shelf tables, requiring only two slabs drilled at corners. Threaded wood type at left is just inserted in holes and screwed together. Fancier Stanley type at right has ferruled lower leg and spacer sections of varying lengths.

## Two ideas from a table designer's scrapbook



**CONVERTIBLE TABLE** has legs pivoted at ends of crossrails. Flopping legs one way or the other, you get either four short ones for a coffee table, or four tall legs for comfortable dining.



**UNUSUAL LAMINATED TABLE** can be made by ripping scrap plywood into 1½" or 2" widths and gluing them together *edge up*. Secret of a smooth top is lots of sanding and filling.





# Home-Movie Hints

By Ken Murray

**PUT YOUR CAMERA INTO THE ACTION** by mounting it on an improvised dolly. With a tripod head clamped to the handlebars, wheel a bicycle into a scene, or chase alongside your actors as they run or ride. For less strenuous action, a three-wheel caster makes a good floor-level dolly; or you can mount a single caster on each tripod leg.

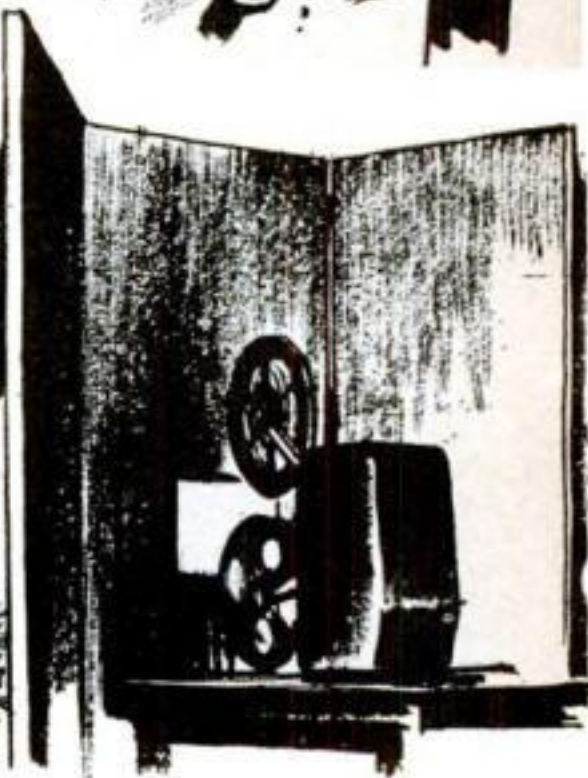
**ADDING A COMIC NOSE** or pointed chin to one of your actors? Don't bother with special make-up putty and adhesive. Just knead a roll of calking compound into shape with the fingers. It's self-adhesive, and accepts cosmetic grease or powder.

**AVOID COLOR CLASHES** in "dressing your set" for filming. When you shoot in color, it's important that clothing and make-up be in harmony with the background. A color wheel or chart from a paint store will guide you in choosing combinations that are tested "eye pleasers."

**DATE YOUR FOOTAGE** at the edge, between sprocket holes, using a miniature dating stamp or a fine pen. With such indexing at the start of each sequence, you'll never wonder how old the kids were when those shots were taken.

**STAGING A GUN BATTLE?** You can get realistic bullet spatters by firing small pellets of dried mud from a slingshot or peashooter. When they hit any solid object in your picture area, they'll burst effectively, with no danger to actors.

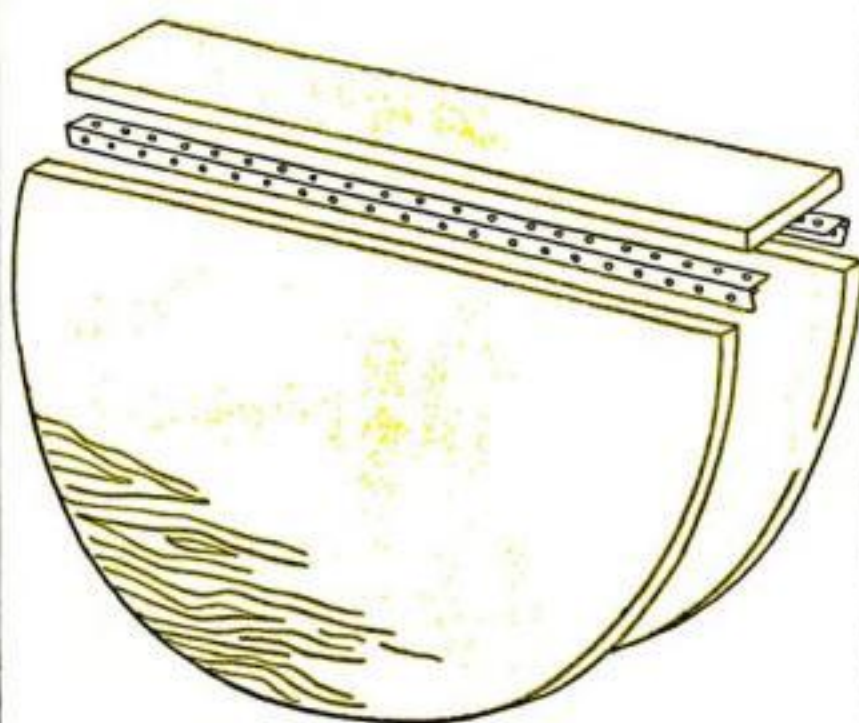
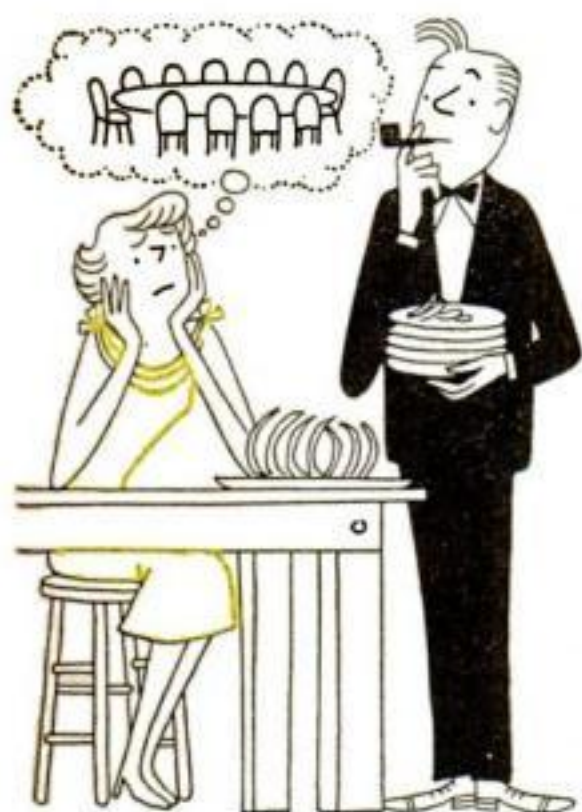
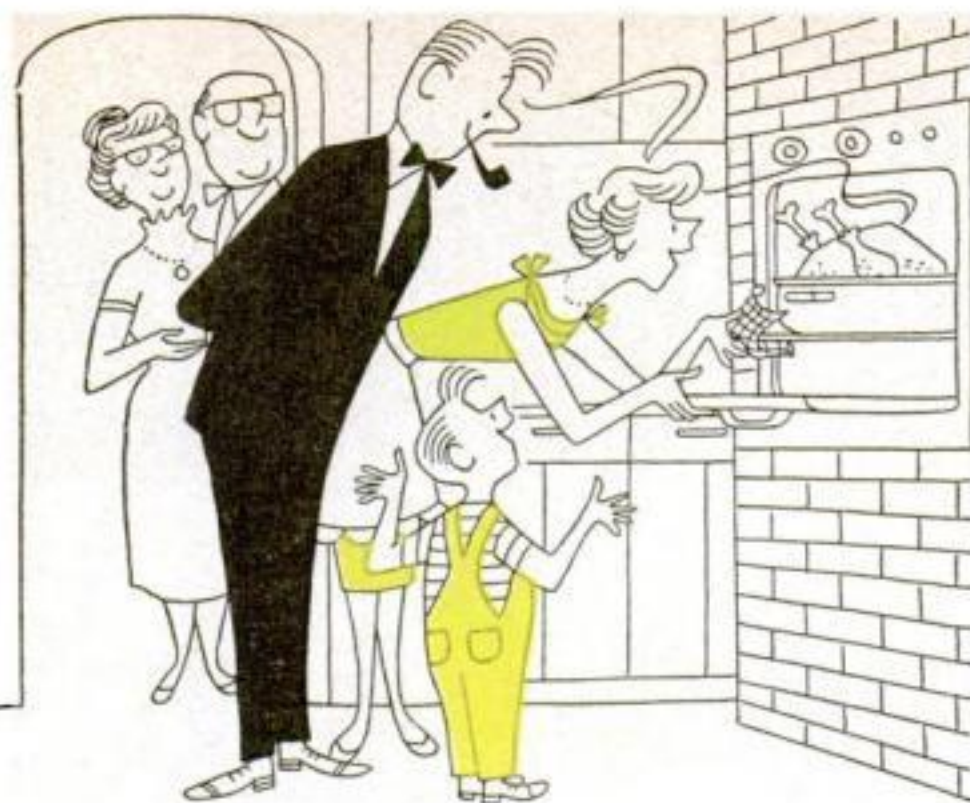
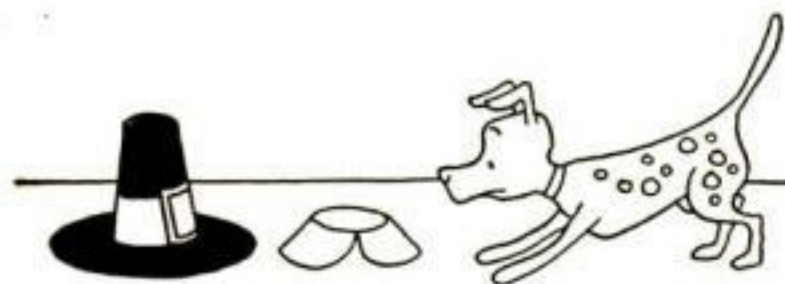
**CHOOSE A PROJECTION LENS** with as long a focus as room size and lamp wattage will allow. This moves the projector well back of the audience, minimizing distraction from motor and blower hum. You can also muffle noise by surrounding the projector on three sides with a folding screen that has a projection window cut into the center panel.



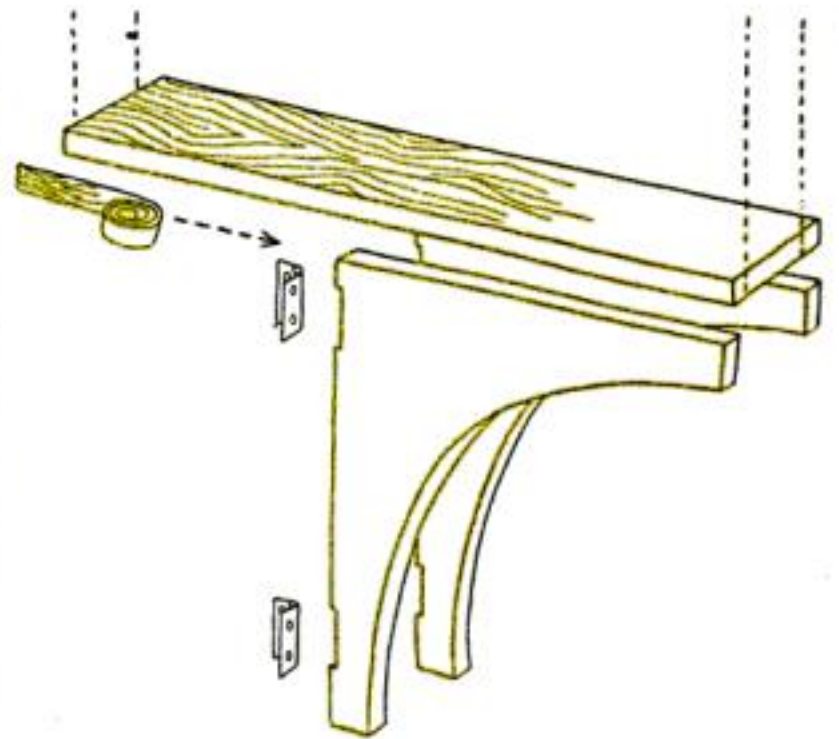
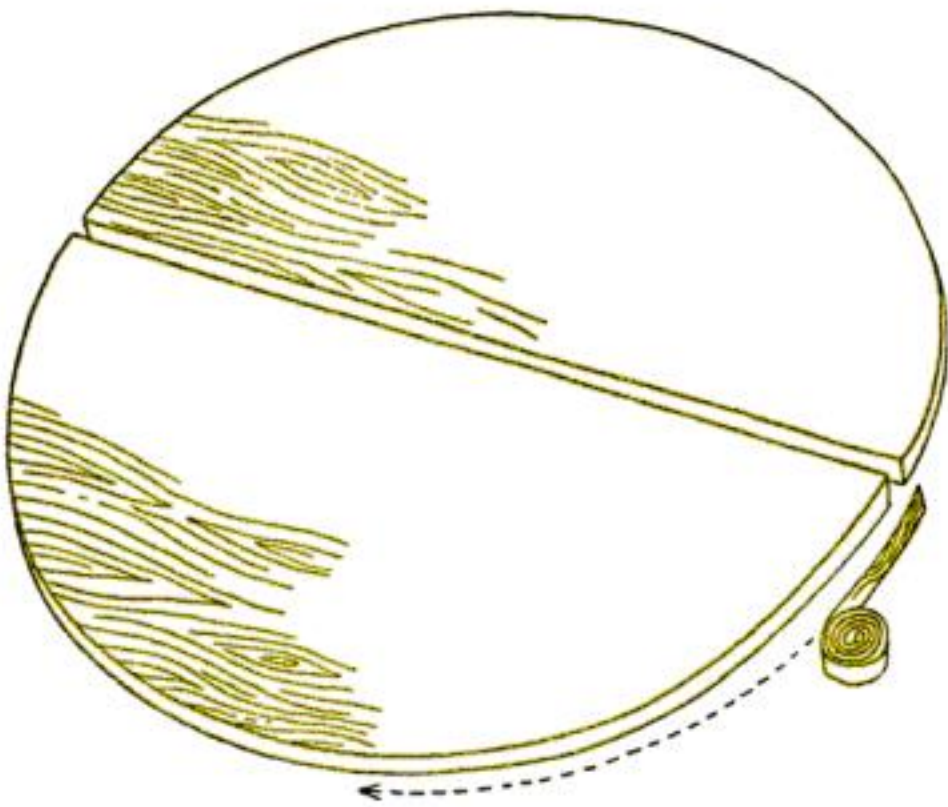


# Wordless Workshop

By Roy Doty  
and Herbert R. Pfister

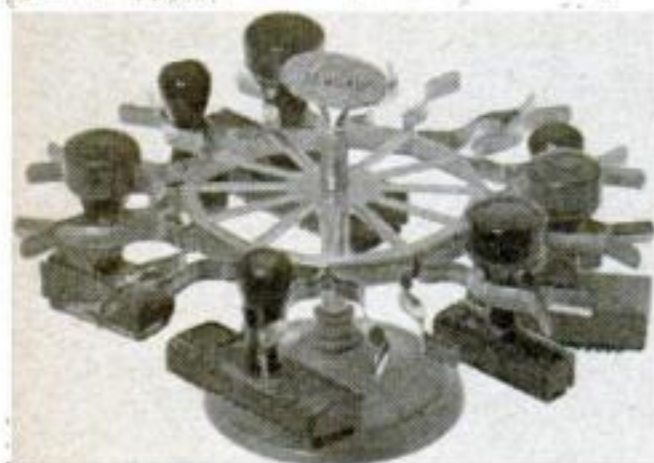








# Photo Ideas



**Quick caddy** for storing items that normally clutter up studio shelves is a ro-



tary holder for rubber stamps. Drill holes in the base and mount it upside down.



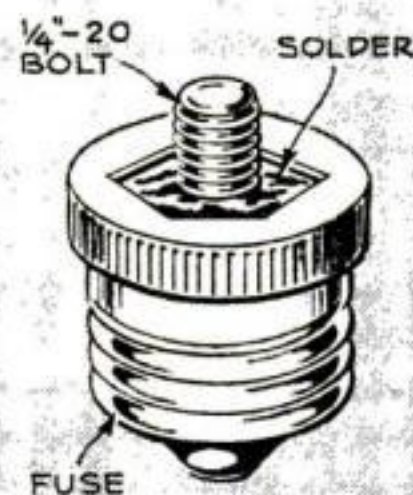
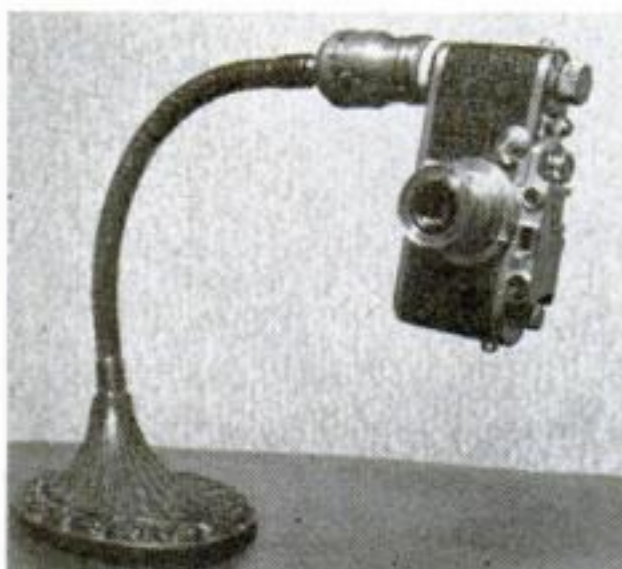
**Home projection booth:** Whether you're showing slides or movies, a permanent enclosure for the projector gives your show a professional flair—especially if it lifts the projector beam well above the heads of your audience. The space under the basement stairs makes an ideal booth. Erect a simple wallboard partition and pierce it with a framed hole. In back, nail a sturdy shelf between the studs for the projector. Add shelves to store your slide files or film cans.



**Paper-trimmer lines** will be easier to see in the dim light of the darkroom if you brush white paint over the cutting platform and wipe it off immediately. Paint will remain in the depressed grid lines.



**Gooseneck camera stand:** An adaptor made from a household fuse will enable you to support a small camera on a gooseneck lamp. Punch out the center of the fuse, insert a bolt, head down, leaving about  $\frac{1}{4}$ " protruding, and drop melted solder in the hole around the bolt. Remove cord and reflector from the lamp.





# Trick Hot Rod Reverses Itself

**N**OTHING stops this little dragster. It scoots along the floor until it bumps a wall or furniture, then simply reverses itself and takes off in the opposite direction until it hits something else.

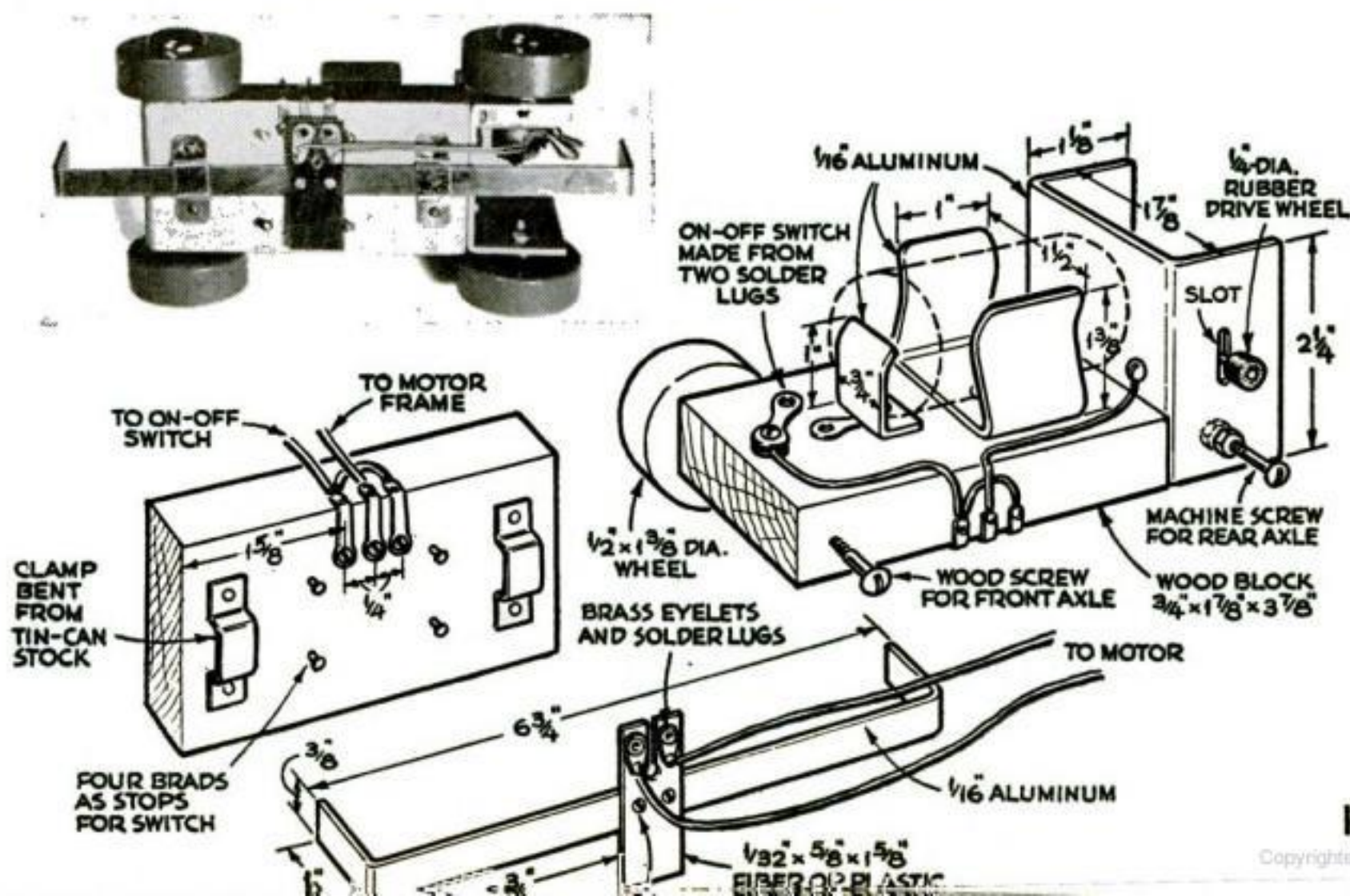
I built the car as a toy for my young son, but was surprised also to find it a wonderful aid in teaching him mechanics and electricity. The automatic reversing switch is a bar that slides along the underside, with its ends bent up to form bumpers. Two contacts on the bar are wired to the motor. These slide past three contacts wired to the battery. Each time the bar is bumped, its motor contacts line up with a different pair of battery contacts. This reverses the current's polarity, and thus the car.

The car itself is just a block of wood with dowel wheels. Brackets to hold the motor and battery can be bent from any thin metal. The motor is the small inexpensive kind sold in dime stores and hobby shops for less than \$1. It drives



one rear wheel through a rubber friction drum cemented to the shaft. I cut the drum from sponge rubber, but it could be built up by wrapping the shaft with rubber electrical tape.

Cut a slot for the motor shaft so it can be adjusted up or down for correct pressure of the friction drum. A scrap of plastic or fiberboard on the switch bar insulates the sliding contacts. Slit the insulation between the two contacts so they'll flex independently for good contact. The wooden drive wheel does fine on smooth floors, but can be wound with a rubber band for better traction on rough or carpeted surfaces. Chrome furniture glides make flashy hubcaps for the racer's wheels and conceal the ends of the axles.—*Robert Micals.*





## A black and white photograph of a man sitting on a large, rectangular object, possibly a crate or a piece of equipment, outdoors. He is wearing a dark cap, a light-colored jacket, and dark trousers. He has his arms crossed and is looking down at his feet, which are wearing light-colored sneakers. The background shows a sandy area and some vegetation.

**U**NLESS you're a polar bear, the discomforts of winter fishing can take the edge off the fun. Protection from zero temperatures and chill winds is yours when you build this ingenious shelter.

After the seat is set up and the heating process started, you chop holes in the ice, set your lines,

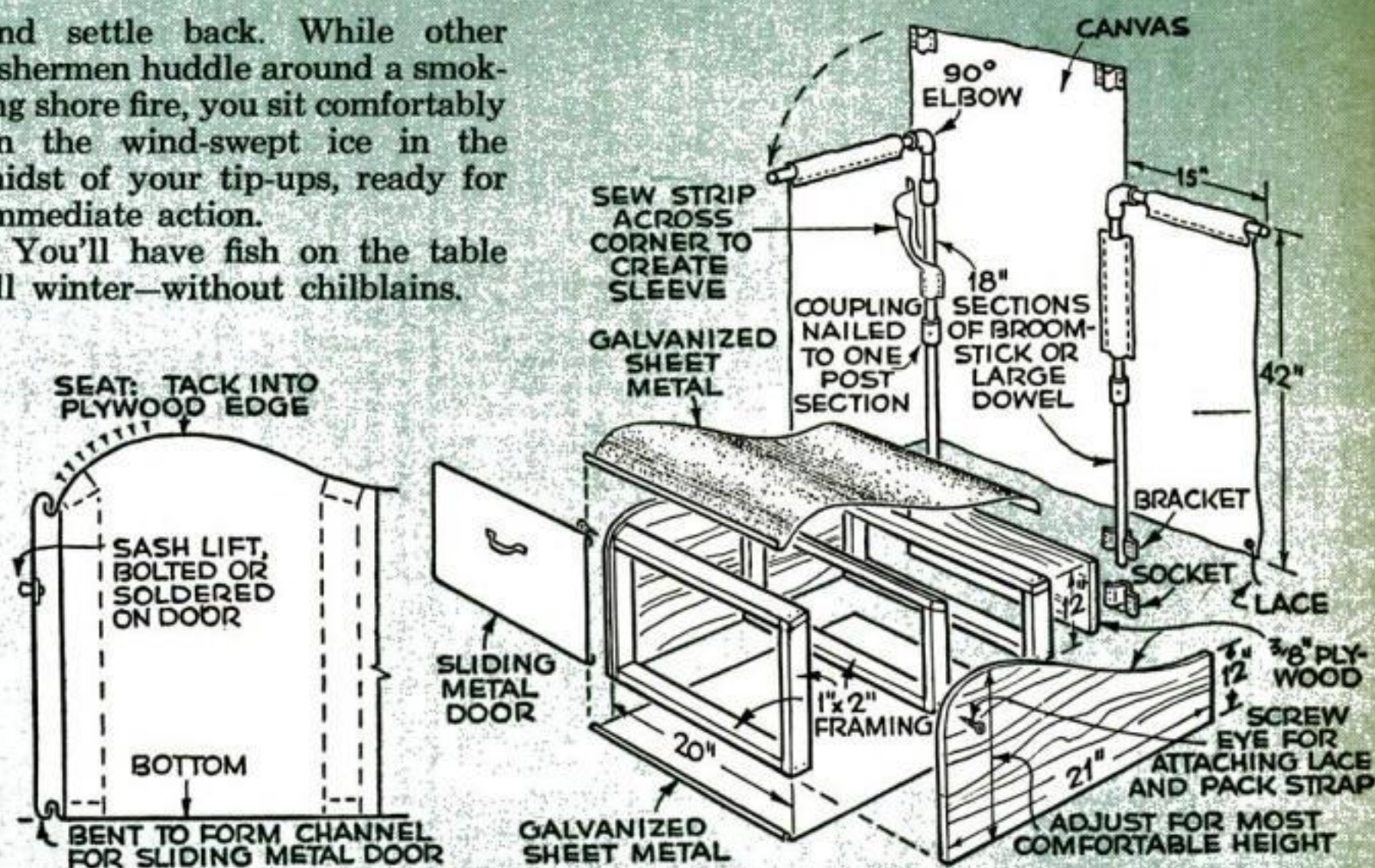
**A** GADGET that monitors your line (it waves a flag when it needs your attention) permits you to relax on your hot seat until there's a fish to reel in. Set out several tip-ups and you can tend as many lines as you want to cut holes for.



# for Ice Fishing

and settle back. While other fishermen huddle around a smoking shore fire, you sit comfortably on the wind-swept ice in the midst of your tip-ups, ready for immediate action.

You'll have fish on the table all winter—without chilblains.



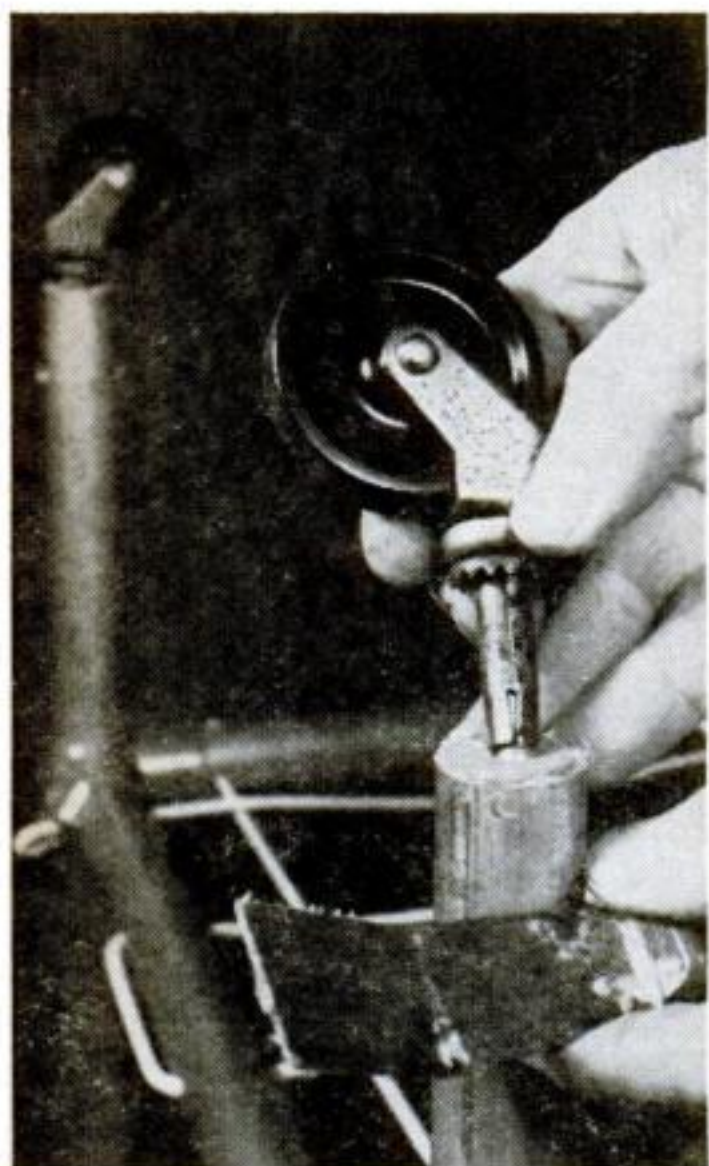
**COLLAPSED INTO A PACK**, the lightweight shelter is easily toted across the ice to the fishing site. Box also holds all of the day's supplies. This angler carries a folded tip-up.



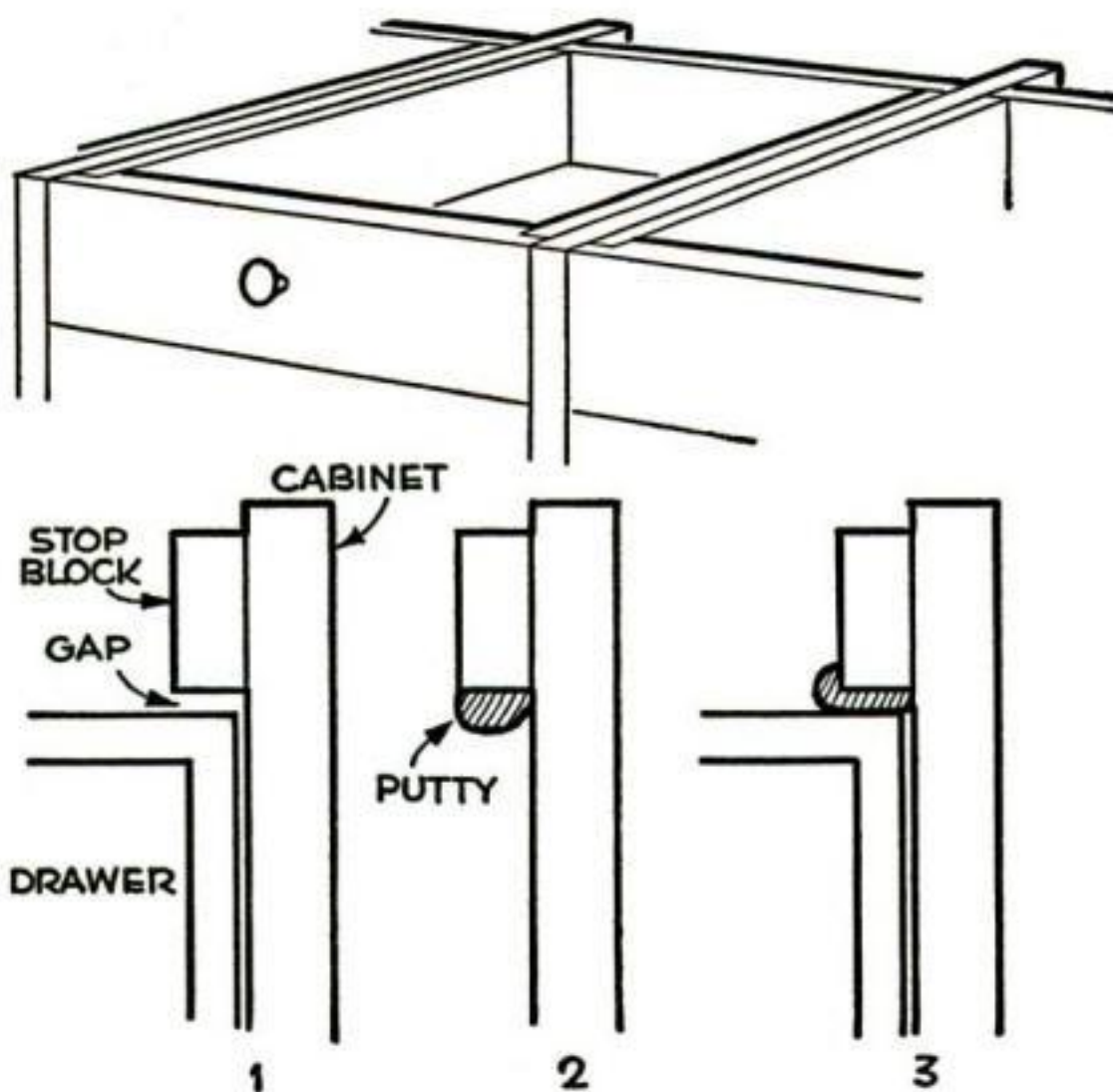
**HEAT IS APPLIED** by sliding front panel aside and inserting one or more containers of canned heat into compartment under the seat. Light it, close the door, and seat above warms up.



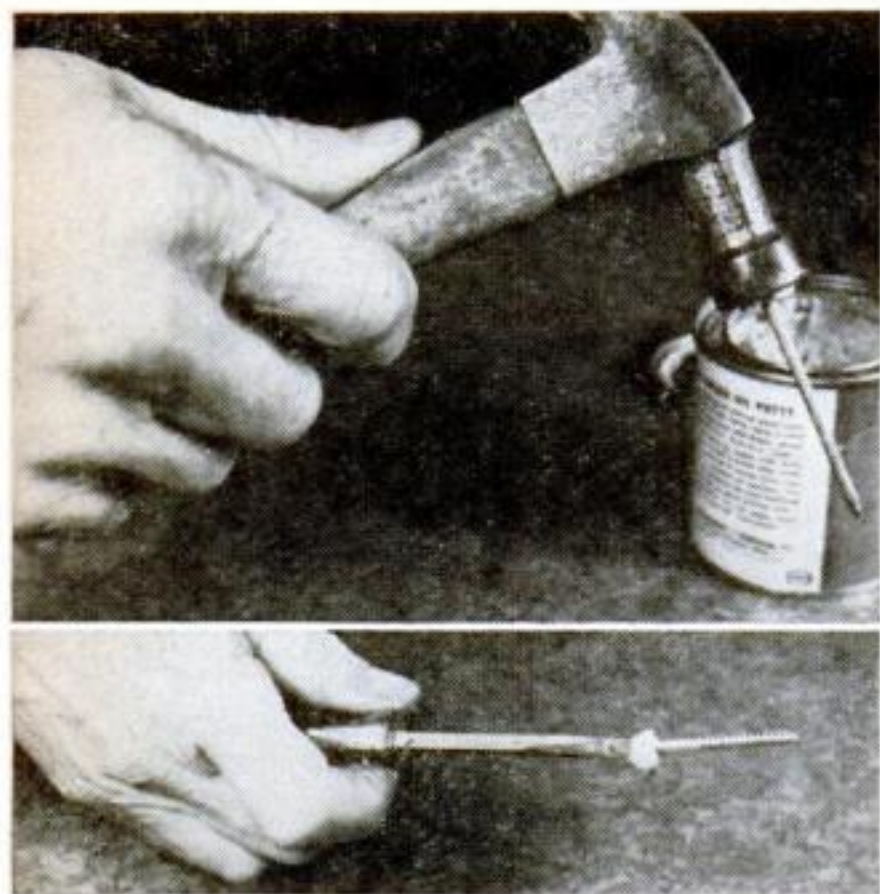
# 7 Offbeat Uses for



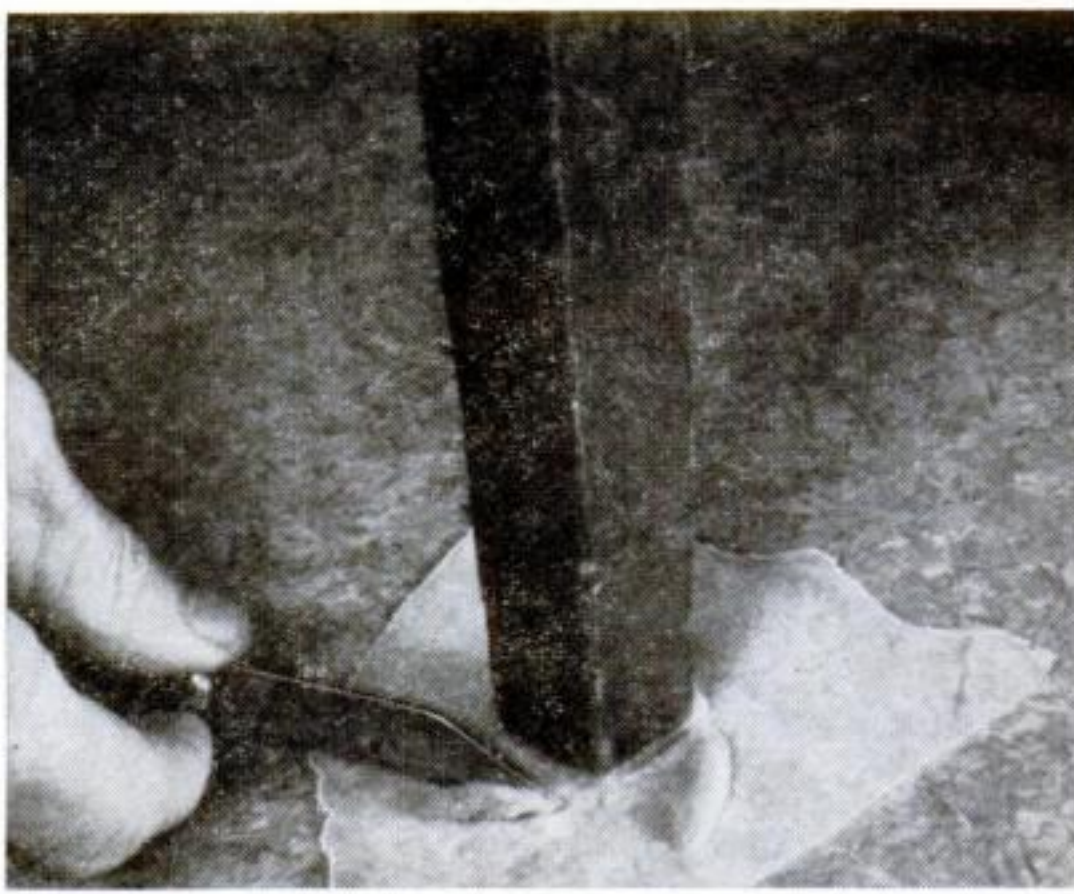
**To snug up a loose caster,** fill the hole with water-mixed or ready-to-use wood plastic putty. Insert the caster's stem, packing the putty in around it as you press it into the hole.



**Locating a drawer stop perfectly** is easy this way. First attach the stop so there's a gap between it and the drawer (1). Place a small lump of putty on stop (2) and grease drawer's back corner with a candle. Push in drawer to exact position (3) and leave until the putty hardens.



**Start nails or screws** in tight spots like this. Use a pea-size blob of putty to hold the nail or screw to the hammer or screwdriver as you start to drive.



**To even furniture legs,** set the chair or other piece on a level surface. Place the short leg on a gob of plastic putty on wax paper. Cut away the excess putty.



# Putty



**Damaged asphalt tile** can be patched with two or more colors of plastic putty. First fill the area with a color matching the basic tile shade. Then smear on pattern colors. Knife can be used to outline the edge. Sand smooth when dry.



**For training vines,** stick plastic putty to a stucco, brick, concrete, or stone wall. Press in a staple or tack. Tie the vine to this when the putty has dried.



**Make a lapel pin,** a fine rainy-day project for a youngster. Start with a jar lid  $\frac{1}{2}$ " deep and a small figurine. Fill the lid with water-mixed or wood putty, cover the figurine with cold cream, and press it into the putty. When mold hardens, remove the figurine, wipe cold cream over the mold, and fill it with more putty. Embed the back of a safety pin in the fresh putty. Let this putty harden, then remove it and trim with a razor blade. Dip the finished pin into bright paint.



**How to build a vehicle  
that will let you ride in  
comfort where even walking  
would be difficult—**

# **The Three- Wheeled Desert Scout**

**By V. Lee Oertle**



**T**HE one place it makes no sense to drive this handy little vehicle is on the road. When the road ends, it comes into its own. Unload its 200 pounds from station wagon or trailer, crank up the geared-down, 4½-hp. engine, and it'll carry you just about anywhere you want to go—through country lanes, cow pastures, swamps and bogs, over out-of-the-way beaches, or deep into the desert.

New fat tires are the secret of its go-anywhereness. They're a full 12" wide across the tread, 16" in diameter. This broad, flat footing gives the buggy a sure grip wherever you go. For sand or soft earth, you carry only two pounds of air in each tire. Where you need greatest traction, fill them with water to add weight.

Goodyear dealers can order the Terra-Tires for you at about \$35 each. Price is expected to drop. Wheels are available from Hadco Engineering Co., Los Angeles, Calif., or from Geneva Wheel Co., Geneva, Ohio.

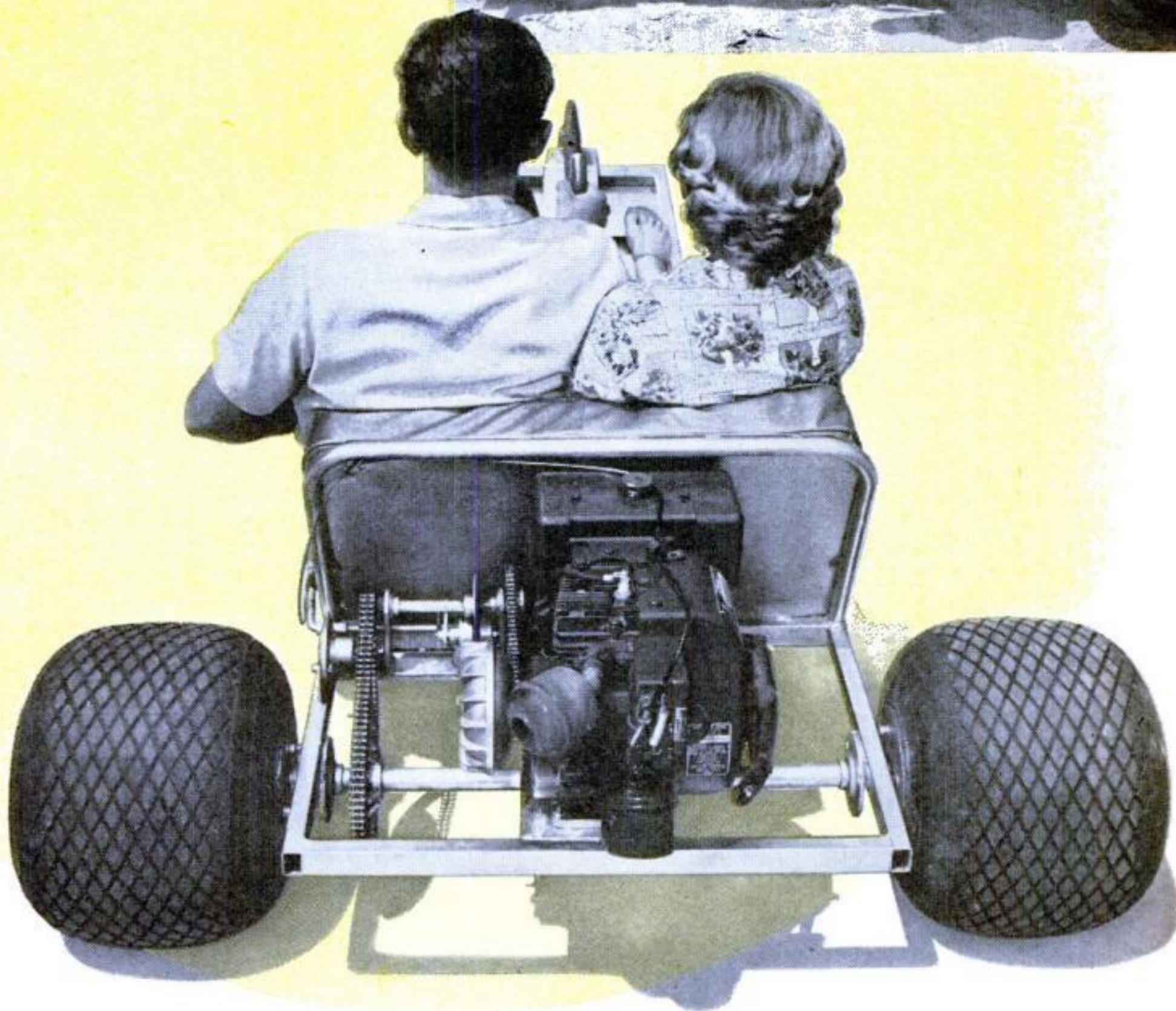
**Getting ready to roll.** The two rear wheels are keyed to a 1" axle, 60" long, to provide a wide tread for stability on hills. The ends of the axle are shouldered to ¾", threaded and slotted for the keys that lock the wheels in place.

The front wheel is mounted on a yoke—as on a tricycle. The three wheels stay in contact with the most uneven ground, eliminating any tendency for the frame to twist. The single front wheel simplifies construction and handling.

Chalk the outline of the frame on a smooth floor, and sit down where you've drawn the seat. If the dimensions given



**LOAD THE BUGGY** into a station wagon to carry it over the road. A couple of two-by-fours serve as an unloading ramp at road's end. A sprocket-and-chain drive (below) steps up the 4½-hp. engine's torque, enabling it to haul two people with ease.



don't suit your leg length, tailor the buggy to your size by making the side members shorter or longer.

**Starting the buggy.** Cut the frame pieces from rectangular steel tubing. Fit them together on the floor, mark them, and take them to a welder. It cost me only \$18 to have the frame expertly heli-arc'd together. The seat back, armrests,

rear-axle bearings, motor-mounting plate, and jackshaft supports were also welded in place at this time.

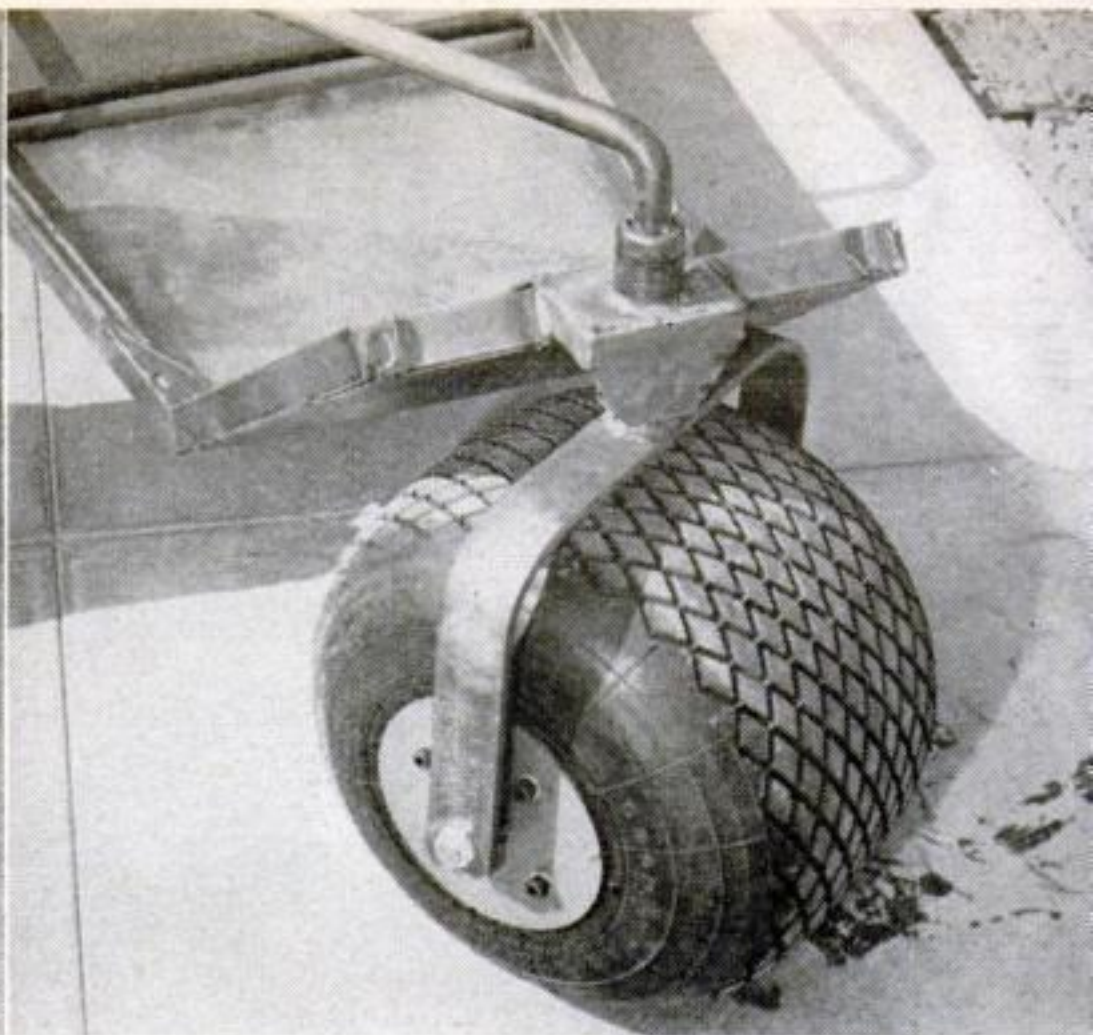
On a second visit, I had the floor pan, steering sleeve, and bushings for the brake and throttle arm welded to the frame. These had been cut and fitted between visits to the shop.

I also had the welder bend the front-





**MOUNT REAR WHEELS** on axle and check inside clearance before cutting frame parts. Rectangular steel tubing was chosen for maximum rigidity, but round tubing could be used.



**SIMPLE TILLER** steers front wheel. Sleeve is welded in vertical position to front of frame, braced securely with steel gussets. Telescoping steering arm fits over tiller shaft.

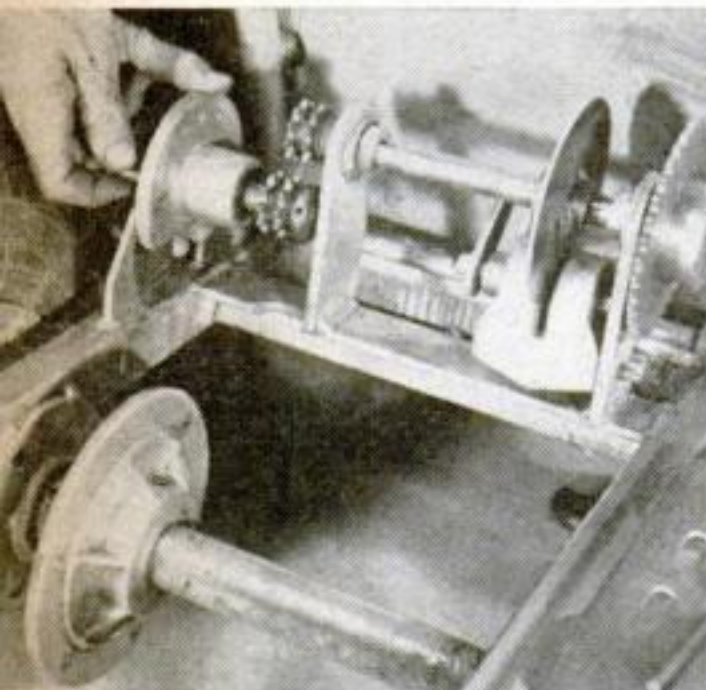
wheel yoke from a length of husky  $\frac{3}{8}$ "-by-2" hot-rolled steel. I held the 1" tiller rod in position while he butt-welded it to the center of the yoke. A steering arm of 1"-i.d. steel tubing is pinned to the tiller with a bolt and wingnut. Bolt holes spaced at intervals along the tiller permit adjustment of steering-arm length.

The 1" tiller rod turns in a sleeve welded through a hole in the front of the

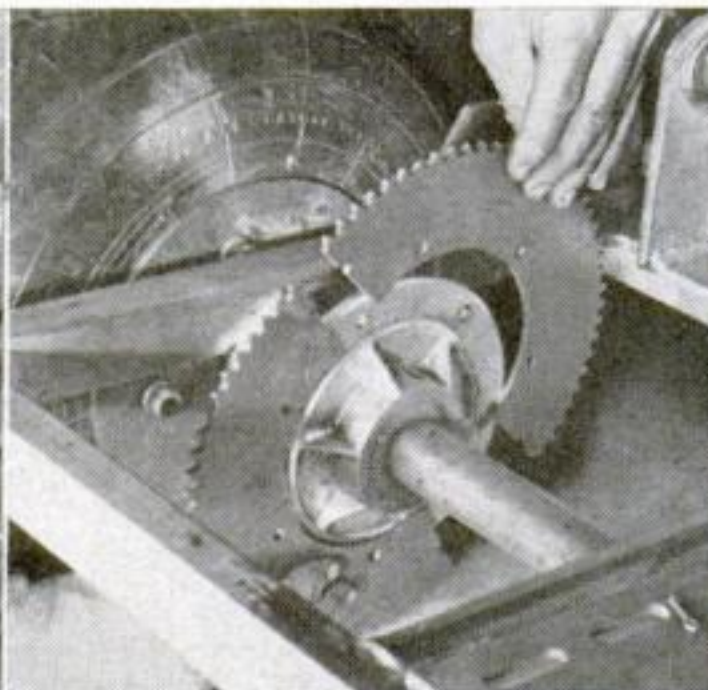
frame. Bearings were setscrewed to the rod at each end of the sleeve.

The front wheel rolls on sealed bearings pressed into the hub. It is mounted on a 1" axle bolted across the open end of the yoke.

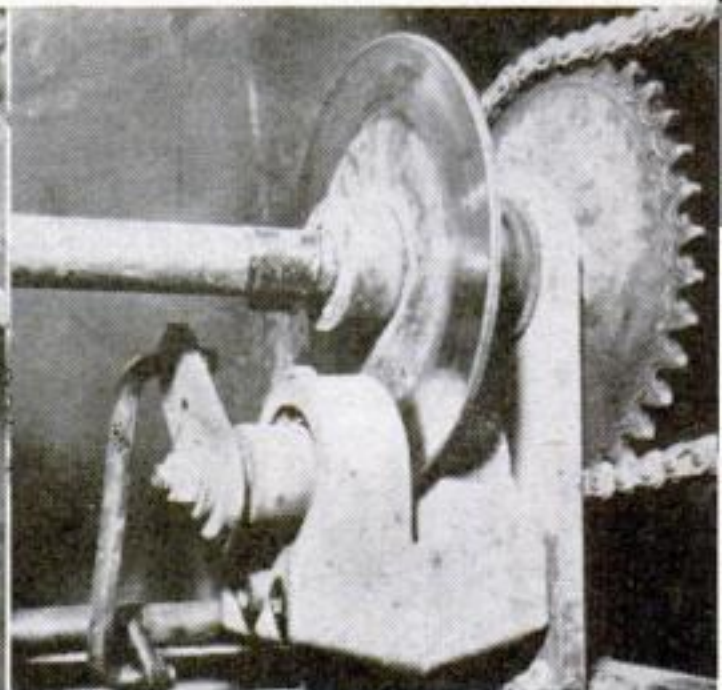
**Adding the horses.** Any four-cycle engine in the 4- to 7-horsepower class will drive the buggy efficiently. I found a good used  $4\frac{1}{2}$ -hp. engine for \$50.



**JACKSHAFT** between the engine and rear axle allows fast changing of sprockets to suit a variety of operating conditions. Disk for the caliper brake is also mounted on this shaft.

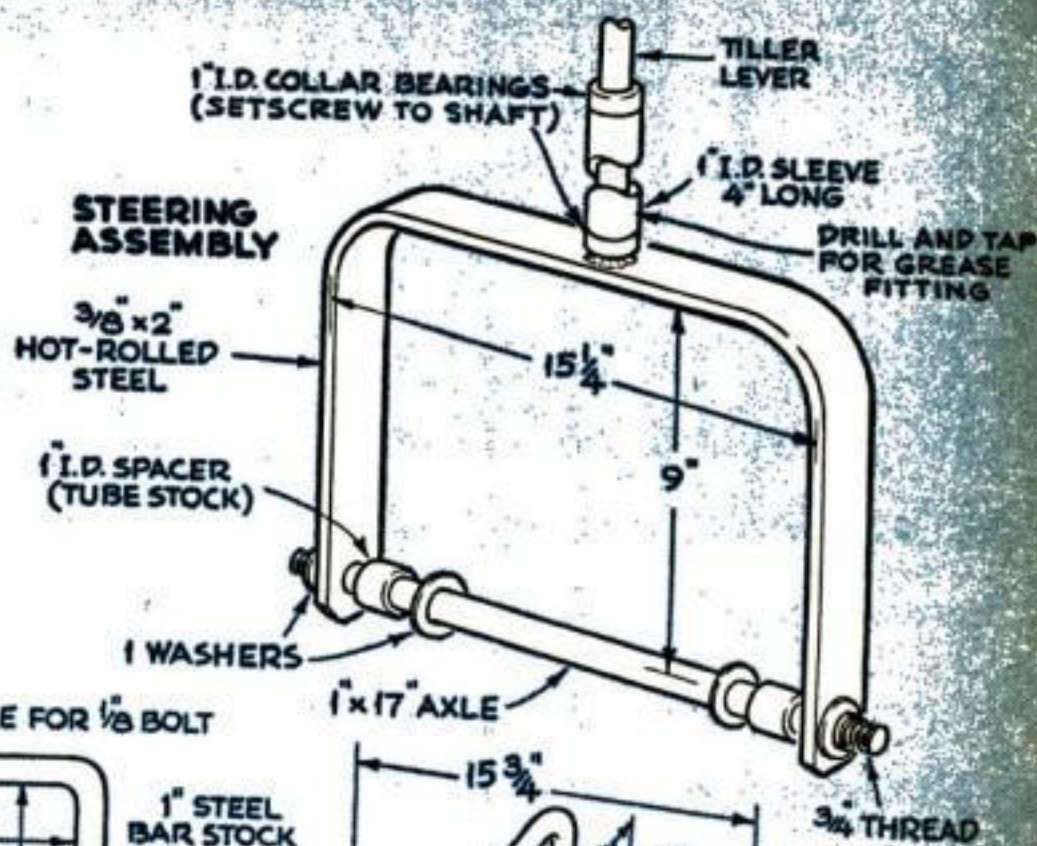


**SPLIT-AXLE SPROCKETS** speed drive-ratio change-over. Segments of various diameters bolt on hub keyed to axle. Two sprockets can be mounted on hub for use with double chain.

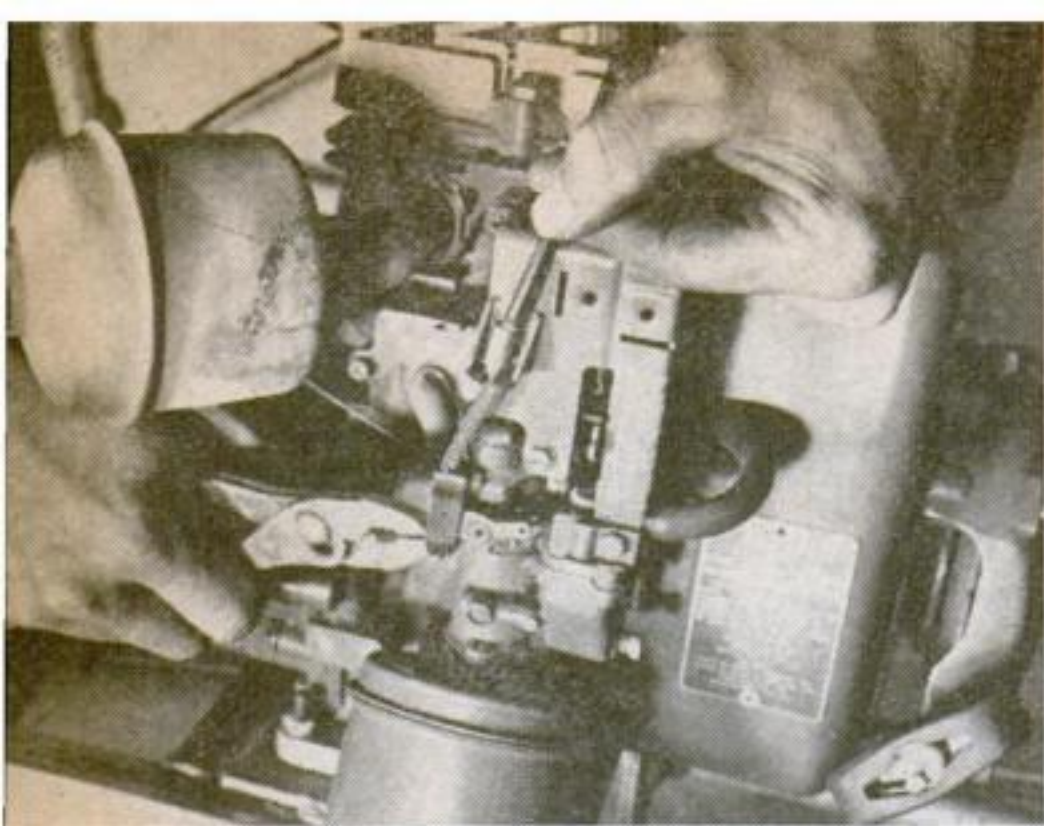


**CALIPER BRAKE**, sold in kart shops, stops disk on jackshaft, effectively braking both rear wheels. Short linkage actuated by a hand lever at side of buggy operates the calipers.

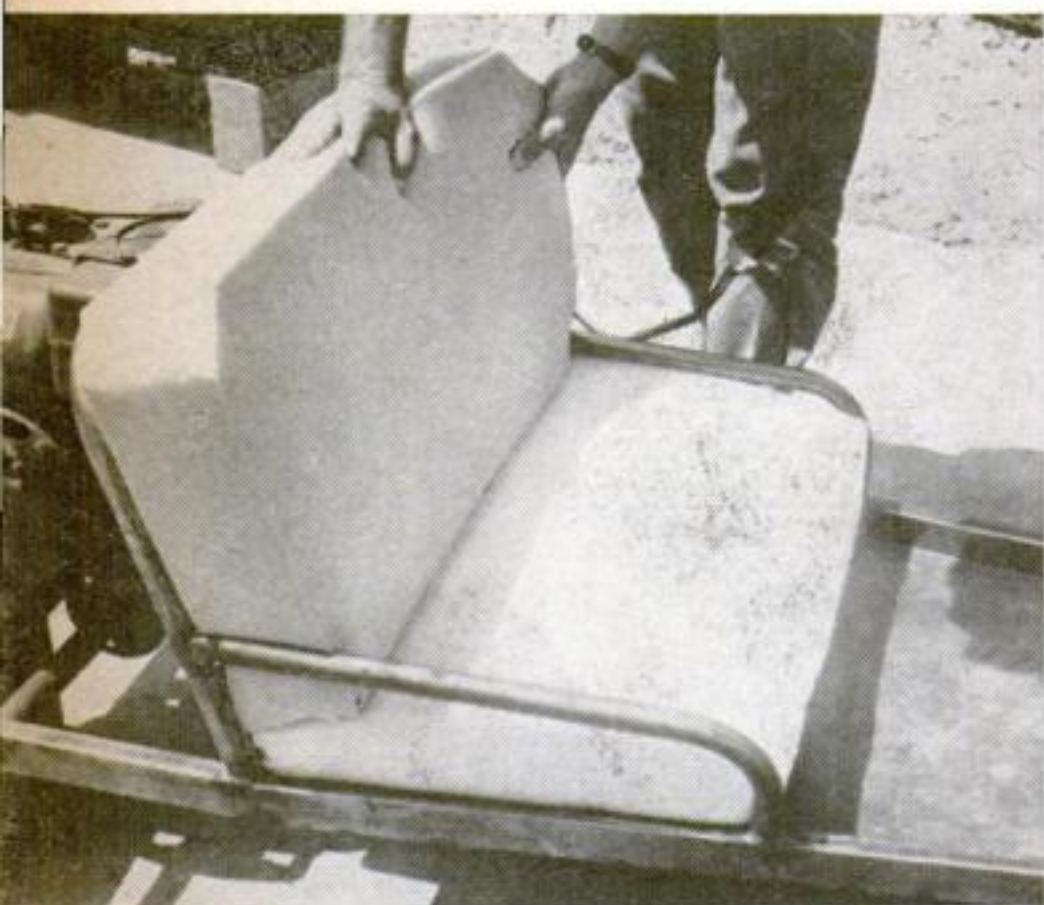








**FLEXIBLE CABLE** connects throttle control to carburetor. Compression spring slipped on cable between housing and linkage returns carburetor to idle when throttle is released.



**TO CUSHION ANY JOLTS** that aren't absorbed by the pillow-like tires, thick foam rubber pads the seat and back rest. Cover foam with plastic or other durable upholstery material.

**FOR ROUGH GOING**, tires can be filled with water. Use a tractor's valve fitting attached to a garden hose. The extra weight provides greater traction and reduces bounce.



A shoe-type clutch could be used but might overheat when pulling over loose turf and sand. A fluid clutch can be bought from Bowlus Engineering, Pacoima, Calif.

You can run drive chains direct from the clutch to the rear axle, but this isn't advisable. The use of a jackshaft provides more flexibility in setting up drive ratios and lets you mount the brake clear of sand and water.

Kart shops stock a variety of caliper-type brakes. Some work mechanically and some are hydraulically assisted. I chose the mechanical type for simplicity—a narrow disk about 5" in diameter that is mounted on the jackshaft. When the brake is applied, a caliper squeezes against the disk.

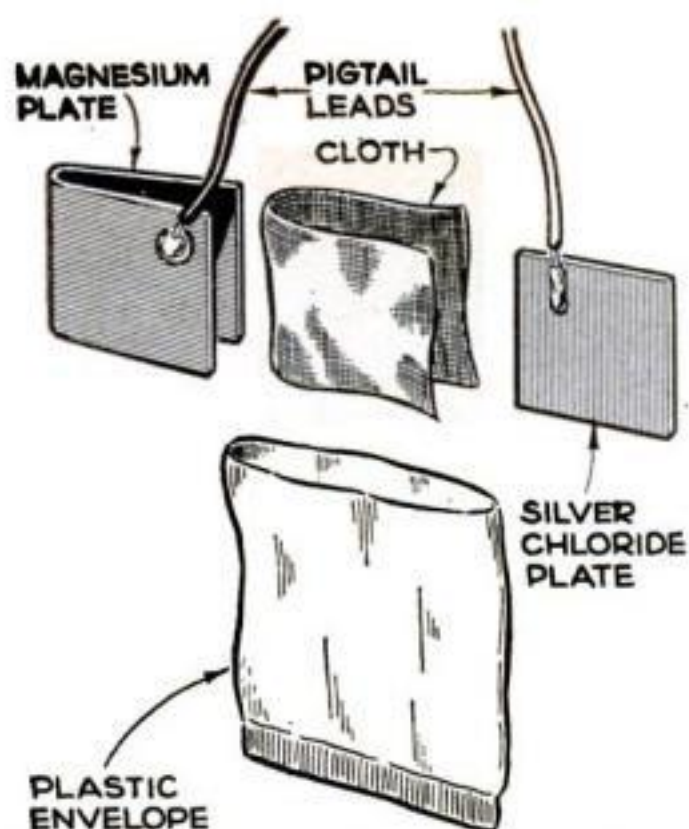
**Riding soft.** To absorb the shocks of driving in rough country, double sprockets and a double-row No. 35 chain were used on the jackshaft and axle. These I obtained from Bug Engineering, Irwindale, Calif. Single sprockets and chain were used between the engine and jackshaft, since the fluid clutch smooths out much of the impact.

By varying the number of teeth on the axle and jackshaft sprockets, you can get a wide range of drive ratios. For flat terrain or beach sand, a 10:1 ratio will push the buggy along at about 18 m.p.h. For climbing and rough-country use, a 20:1 ratio will provide all the power you need; but top speed will be between 8 and 14 m.p.h. Even though speed is reduced, the extra power allows more fun. It's like driving a bulldozer. You feel that no obstacle can impede your progress. To achieve this ratio, I used this combination of sprockets: 13-tooth on the engine, 36-tooth on the jackshaft, 10-tooth on the output end of the jackshaft, and 72-tooth on the axle.

**Making it go.** Controls are simple and can be operated with one hand. Push down on the lever—or pull it up—to apply the brakes. Twist a motorcycle-type throttle on the end of the lever to gun the engine. The fluid clutch automatically engages and disengages the engine from the drive train.

A guard mounted over the sprockets and chain is good insurance against accidental injury, especially over rough ground. This could be quickly shaped from thin plywood or hardboard. ■ ■





**SIMPLE CELL** consists of two dissimilar metal plates separated by cloth. Electrolytic action consumes the silver chloride plate.



# One-Shot Battery Powers Model Plane

By Howard G. McEntee

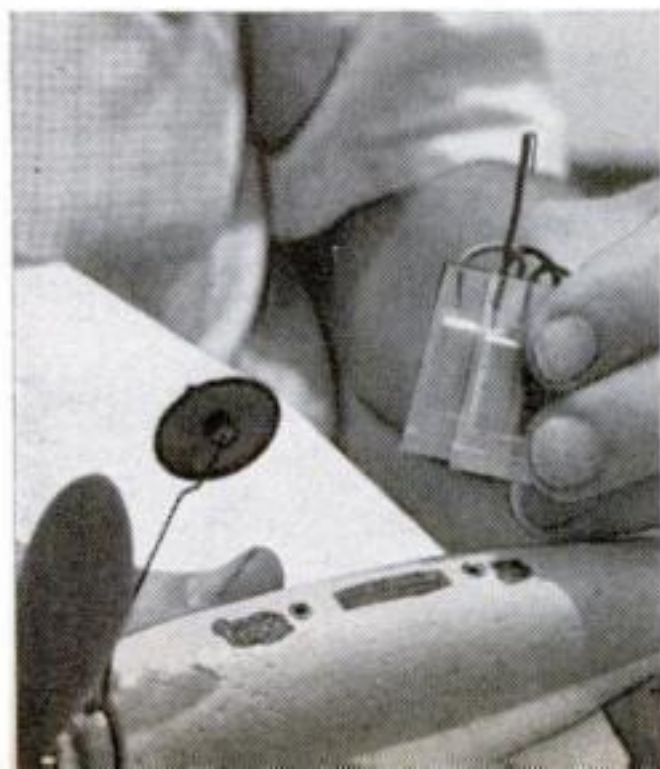
**E**VER see electricity demonstrated by pressing two strips of dissimilar metals into half a lemon and connecting them to a voltmeter? Equally magical is a new dry battery, no larger than a postage stamp. Put a few drops of salt water in the plastic bag that houses two dissimilar metals, and electricity flows through the leads.

Two of the cells connected in series put out 2.5 amps at 2.2 volts for about one minute—enough to power a new lightweight electric plane designed for use with the batteries.

Each cell has two plates—one of silver chloride and one of magnesium—separated by a thin layer of cloth that absorbs and holds the salt solution. The cells are for one-time use. Once activated, they boil and bubble until the silver chloride plate is consumed.

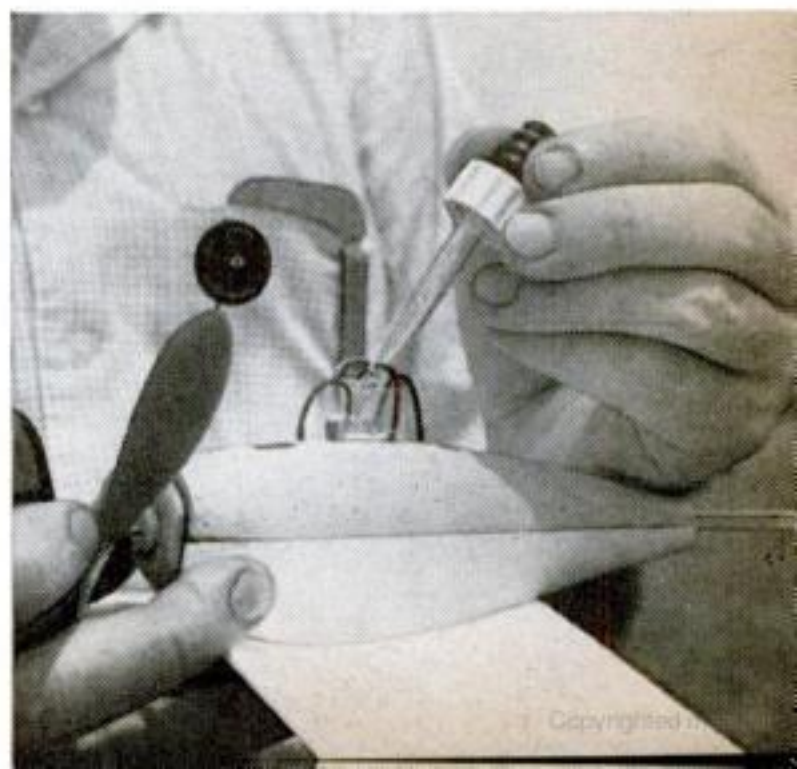
The cells keep indefinitely until activated. Their light weight makes them ideal for powering models too small to carry conventional dry cells.

Polk's Model Craft Hobbies, 314 Fifth Ave., NYC 1, sells the batteries for 20 cents a pair. The foam plane, called Electra-Fly, comes in an assembly kit for about \$3.



**TWO CELLS**, connected in series, fit into a slot in this lightweight styrene-foam plane (left) designed for use with new batteries.

**WIRES CONNECTED**, a few drops of salt water are squirted into each cell. Prop comes to life in a second or two, runs for about a minute.





**Here's simplicity—no castings needed:**

# Rotary-Valve Steam Engine

**By Henry Frostick**

**F**EW sounds are as thrilling as the chugging of a steam engine at full throttle—especially an engine you've built yourself. If you have access to a lathe, this two-cylinder vertical marine model is an easy week-end project.

A modified Corliss-type rotary valve is the secret of the engine's simplicity. The steam passages can be filed by hand to control the intake and exhaust cycles of both cylinders. There are no valve eccentrics or guides, or tricky timing, to cope with. And you don't have to make or buy any castings. All parts are machined from raw metal.

The engine is single-acting. Its stroke is  $7/16$ " in a  $9/16$ " bore. At 30 pounds of steam (or air) pressure, the flywheel will turn up 2,000 r.p.m.

**Turn the crankshaft** from a 4" length of 1"-diameter cold-rolled steel rod. Face the ends of the rod, clamp the rod in a V block on a flat surface, and scribe cen-

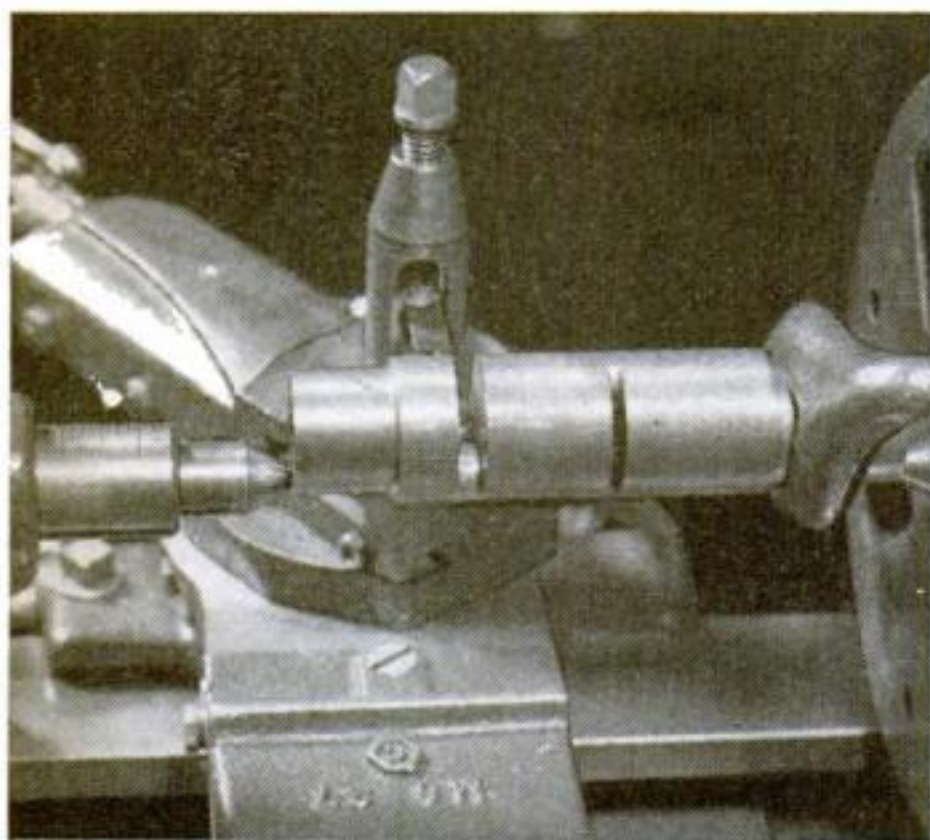
terlines at 90 degrees on both ends. Punch the main centerline where the scribed lines intersect, and punch matching center marks  $5/16$ " out from the center for turning the crankpins. Center-drill all punch marks carefully.

Mount the rod in the lathe on one pair of offset centers and begin turning the first crankpin. Take light cuts, and when the pin is half completed reverse the rod in the lathe on the opposite pair of offset centers and begin turning the second crankpin. Repeat this operation to bring both pins down to finished diameter *together*. If you complete one pin before starting the other, the shaft will be springy and hard to machine.

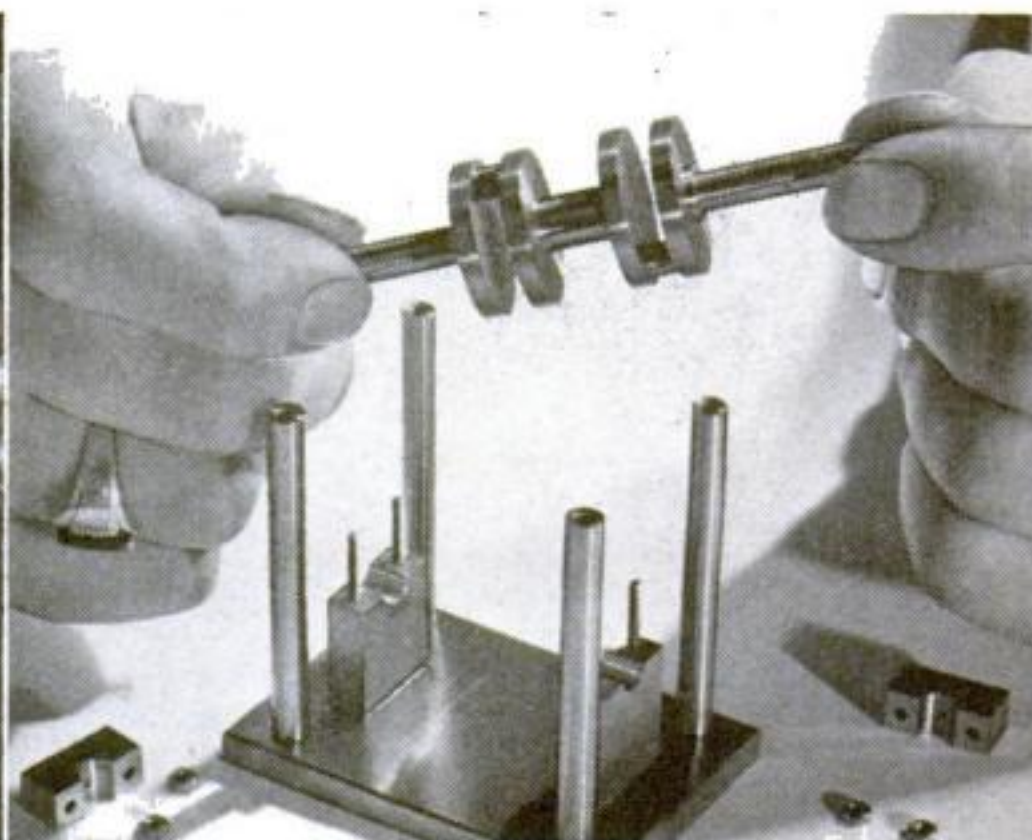
After completing the throws, file two small blocks to fit snugly in the spaces opposite the crankpins. These blocks will stiffen the shaft and eliminate chatter when you machine the remaining diameters on the main center.

**Base and cylinder-block support.** Make the base from  $1/4$ " aluminum or

CONTINUED

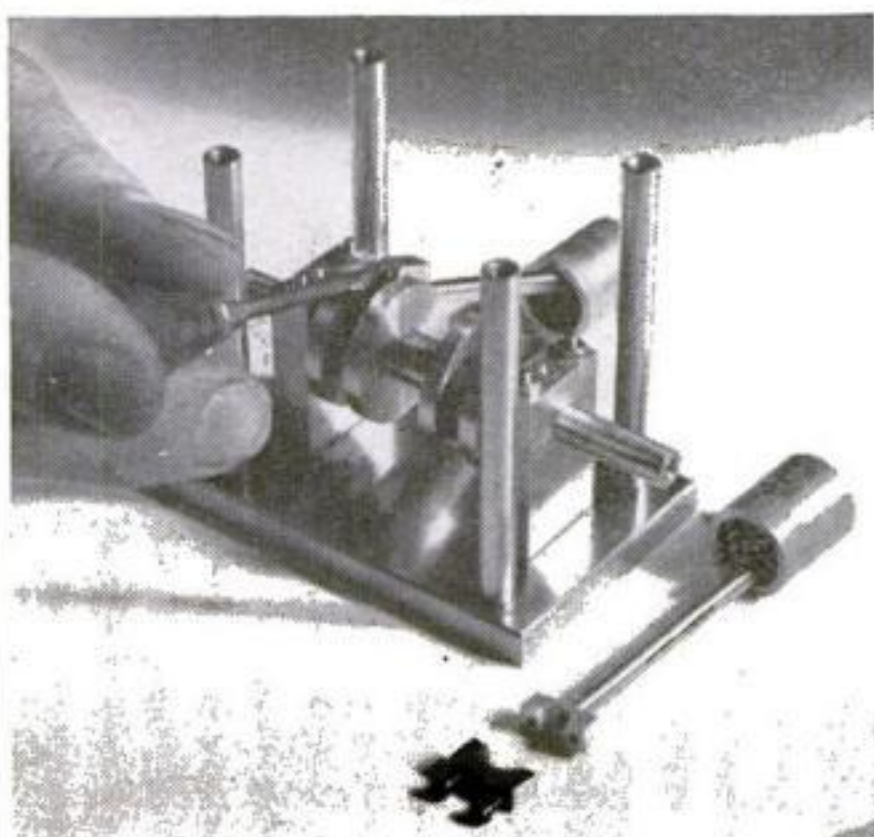
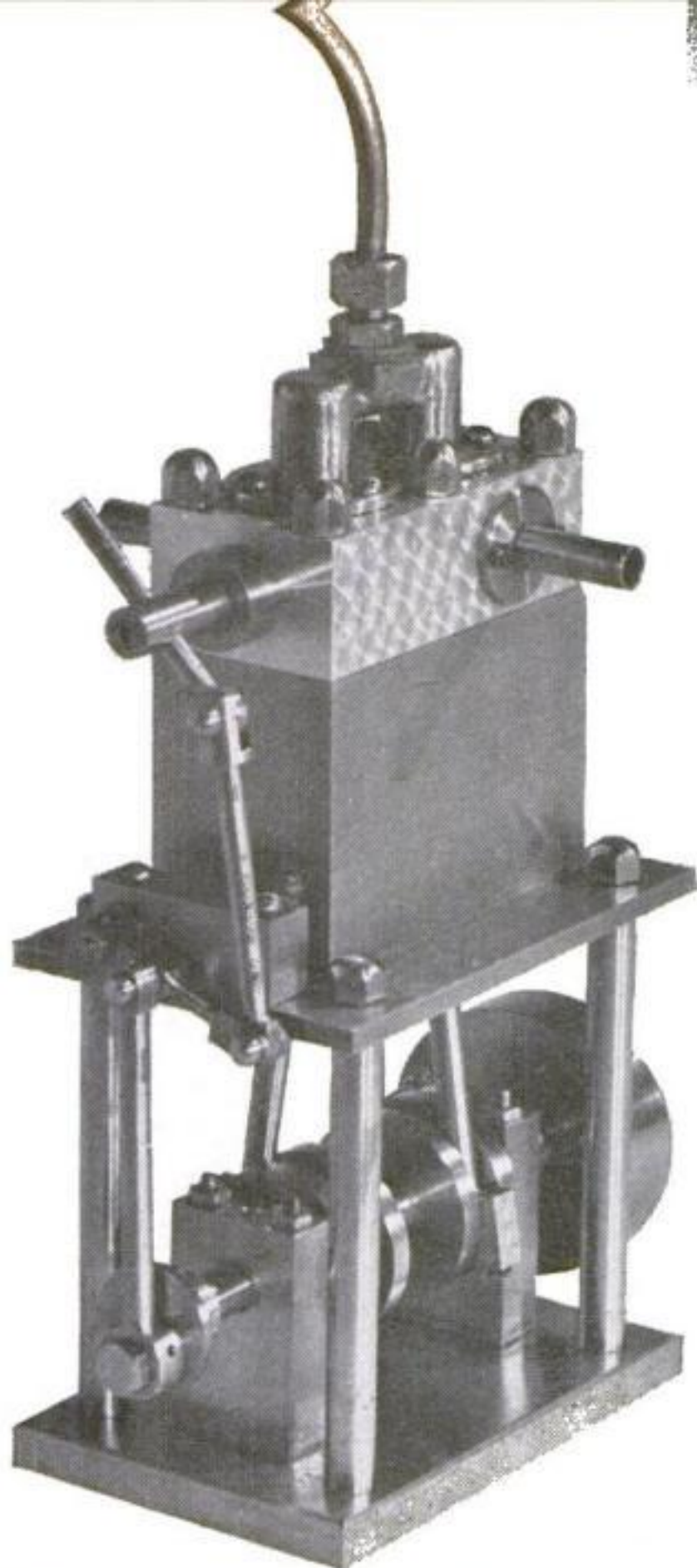


**MACHINE THE CRANKSHAFT THROWS** progressively, cutting each in equal stages, until only very light cuts are required to bring the crankpins to finished diameter. A cutoff tool can be used to reach between the throw webs.

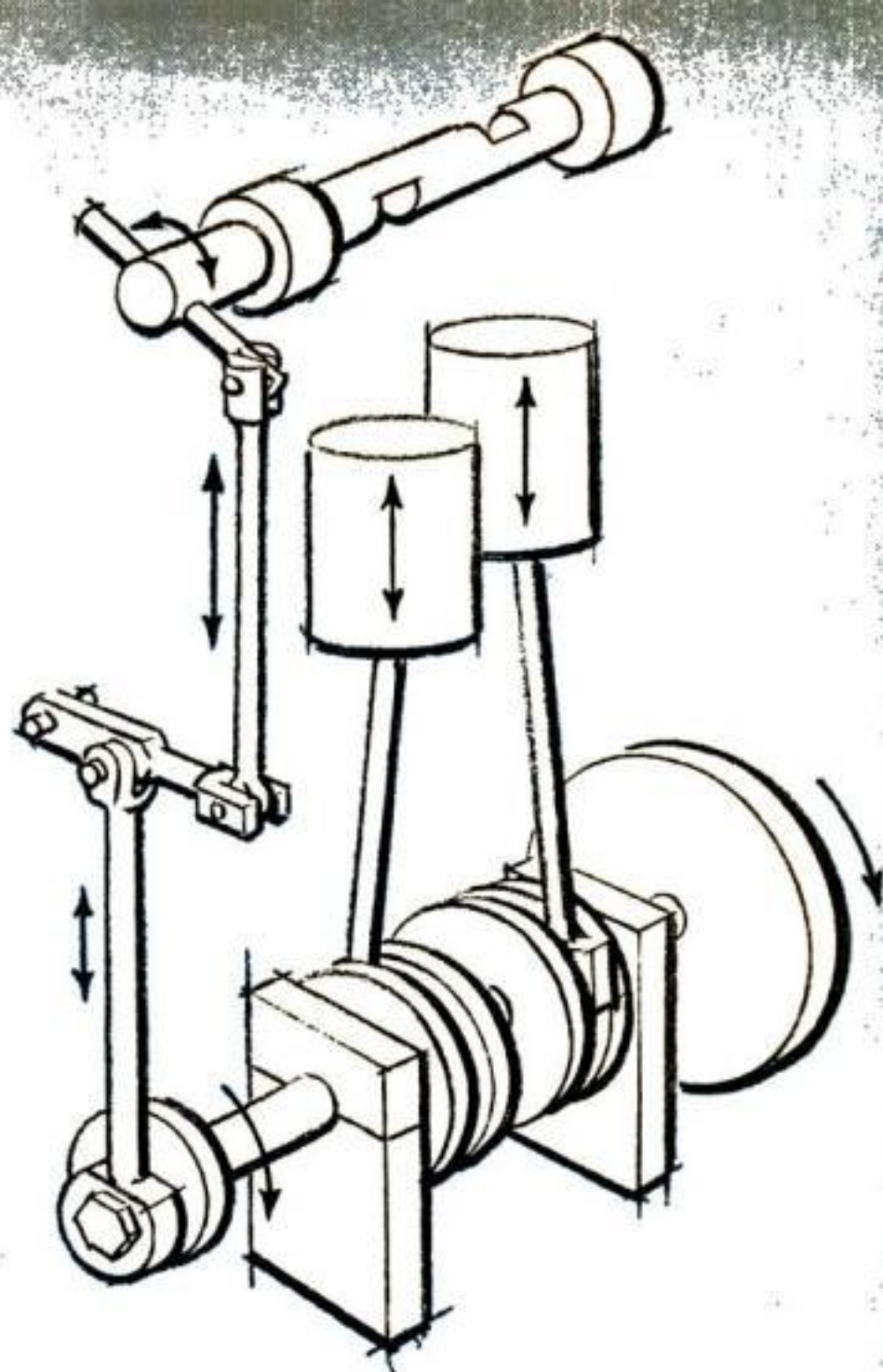


**YOU GET YOUR FIRST THRILL** when you bed the crankshaft in the main bearings and twist it by hand. Studs on bearings are long screws. Drive them in tight, then cut off heads. Four columns on the base support the cylinder block.

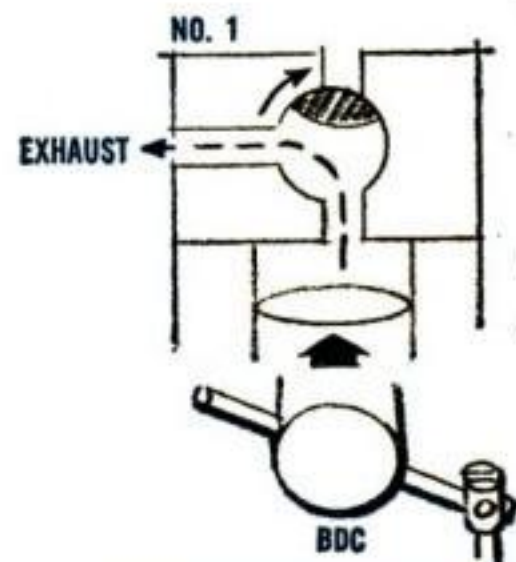
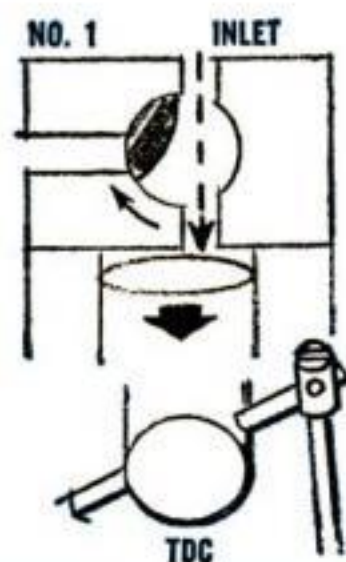
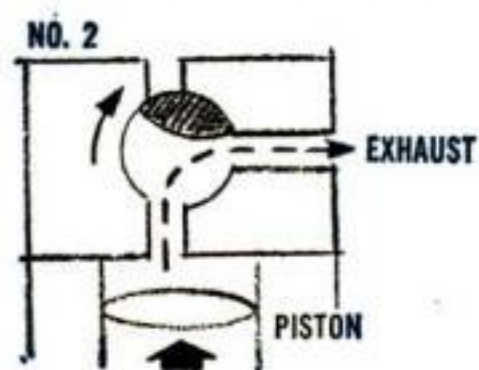




**MAIN-ROD ASSEMBLIES**, with pistons installed, can be fitted to crankpins before cylinder block is added. If too free, shim bearing end caps with thinner paper. Check, too, for binding.



### How the rotary valve works



**WHEN LINKAGE** is at top dead center, No. 1 inlet port is open, piston is on way down. No. 2 piston, halfway up, forces steam out.

**AT BOTTOM DEAD CENTER**, No. 1 piston is halfway up and exhaust port is open. No. 2 inlet port is open, admitting steam to piston.



cold-rolled steel and the cylinder-block support from  $\frac{1}{8}$ " brass. Both are the same size—2" by  $2\frac{7}{8}$ ".

Shape the main bearings from  $\frac{5}{16}$ " brass or bronze. Fit the cap studs to the bearing body and fasten the caps in place with a paper shim beneath them before drilling and reaming the  $\frac{1}{4}$ " holes for the crankshaft ends. The preshimmed bearing can then be adjusted to take up wear. Fasten the bearings to the base and install the crankshaft, using a thin collar at each end of the throws to center them between the bearings. Machine the flywheel and fasten it to the rear of the crankshaft (behind the No. 2 piston).

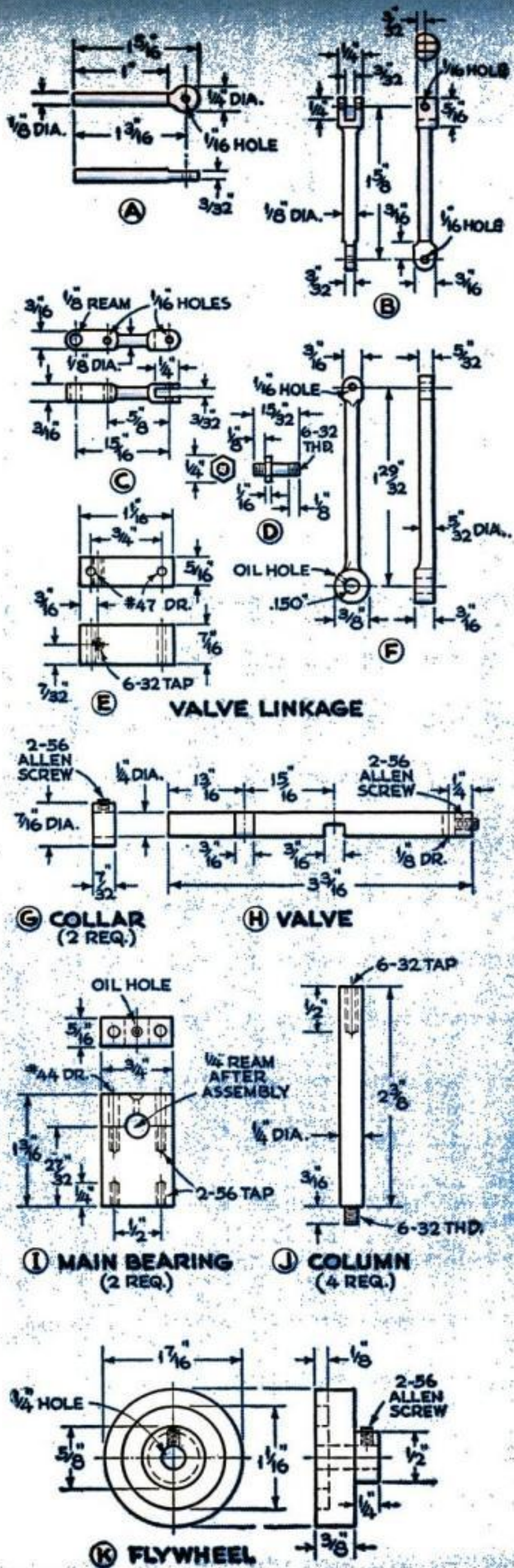
**Cylinder block and pistons** are next in order of construction. If possible, use a bronze block milled to size. This will save you much filing and assure you a square block. Lay out the cylinders and mount the block in the four-jaw chuck for boring in the lathe.

No matter how carefully you bore the cylinders, they'll differ slightly in diameter, so make the pistons fit the individual cylinders and mark them. Turn the pistons from  $\frac{3}{4}$ " steel rod, and bore them hollow as shown. Drill through the walls for the  $\frac{1}{8}$ " wrist pins.

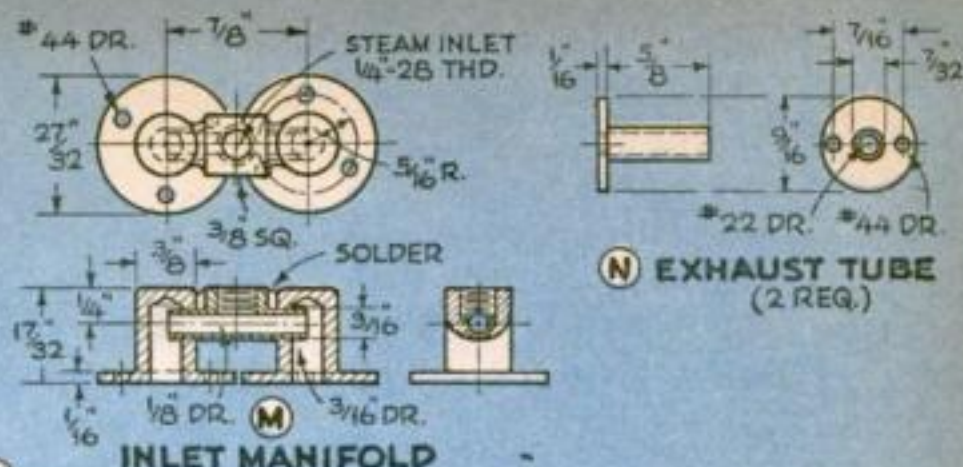
Turn the connecting rods from  $\frac{3}{16}$ " square steel bar. Shoulder the lower end of each rod and thread it #2-56 to join it to its bronze end bearing. Assemble the con-rod bearings before drilling and reaming them to fit the crankshaft throws. Then mount each bearing in the four-jaw chuck and turn a round neck to the diameter of the connecting rod. Drill and tap #2-56 to receive the threaded rod end.

**Cylinder head.** Fit a block of  $\frac{5}{8}$ "-thick aluminum to the top of the cylinder block. Fasten it in place with six #6-32 head bolts turned from  $1\frac{1}{8}$ " lengths of  $\frac{1}{4}$ " steel hexagon rod. Drill and ream a  $\frac{5}{16}$ " hole through the longitudinal center line of the head and press a length of  $\frac{5}{16}$ " o.d. brass tubing into it to line the hole. Ream the inside of the sleeve  $\frac{1}{4}$ ". Press a length of  $\frac{1}{4}$ " dowel in the sleeve to keep the drill bit from deflecting, and drill the holes for the inlet and exhaust ports. Note that the vertical inlet ports are drilled off center to minimize the degree of valve rotation required to admit and exhaust steam.

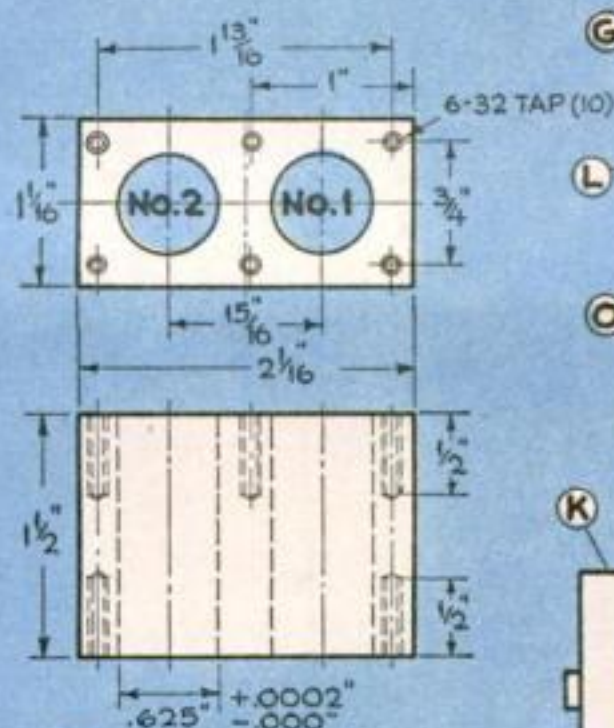
Valve linkage must be installed before



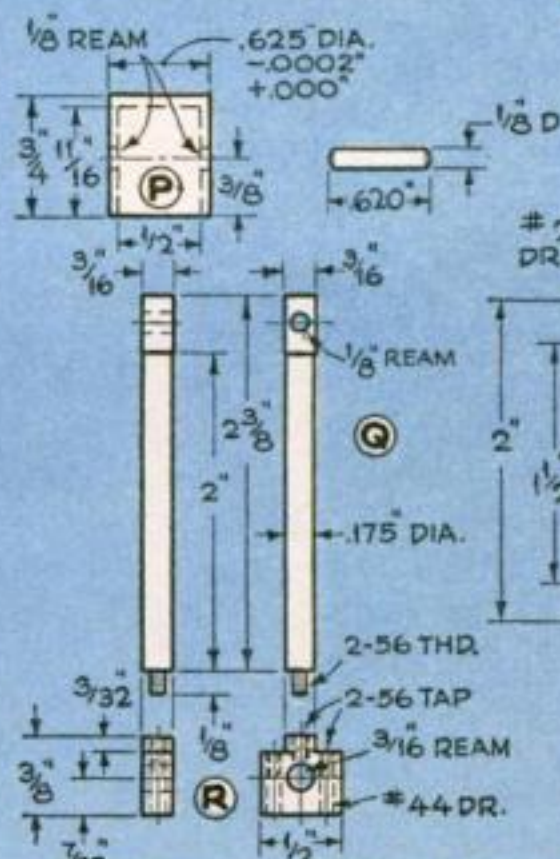




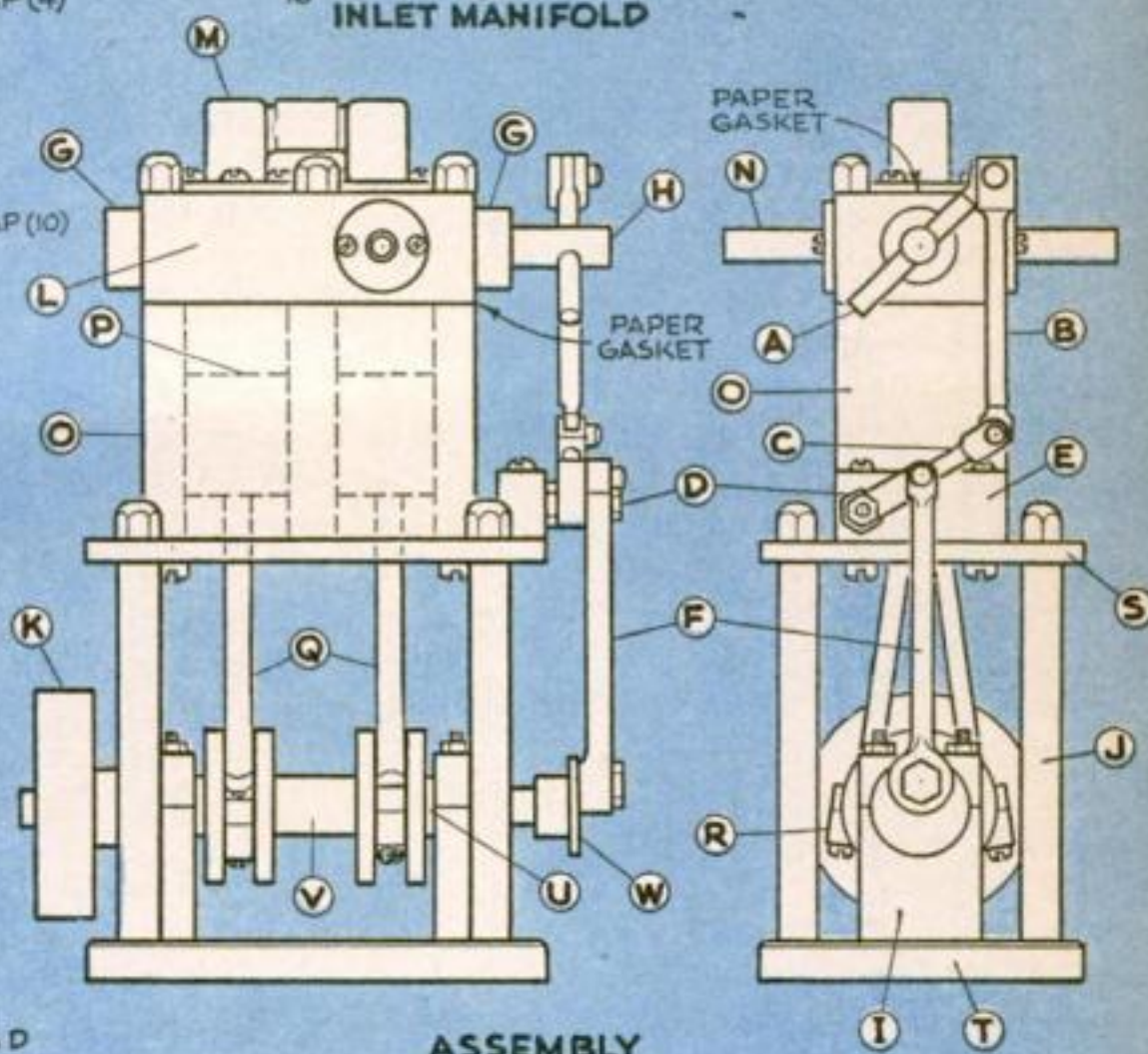
**(L) CYLINDER HEAD**



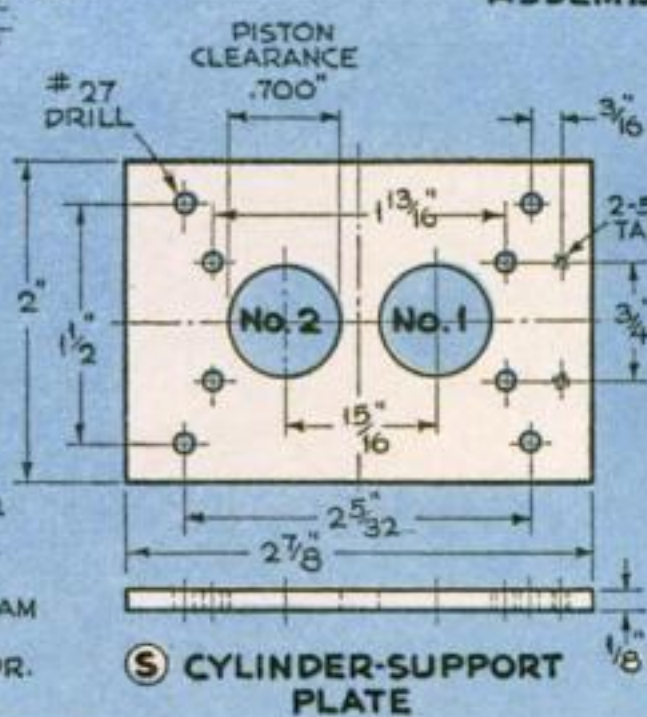
**● CYLINDER BLOCK**



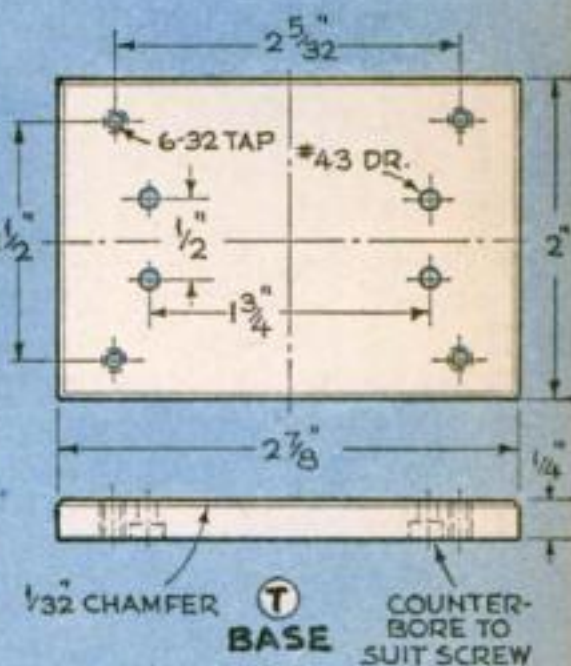
**PISTON & ROD ASSEMBLY**  
(2 REQ.)



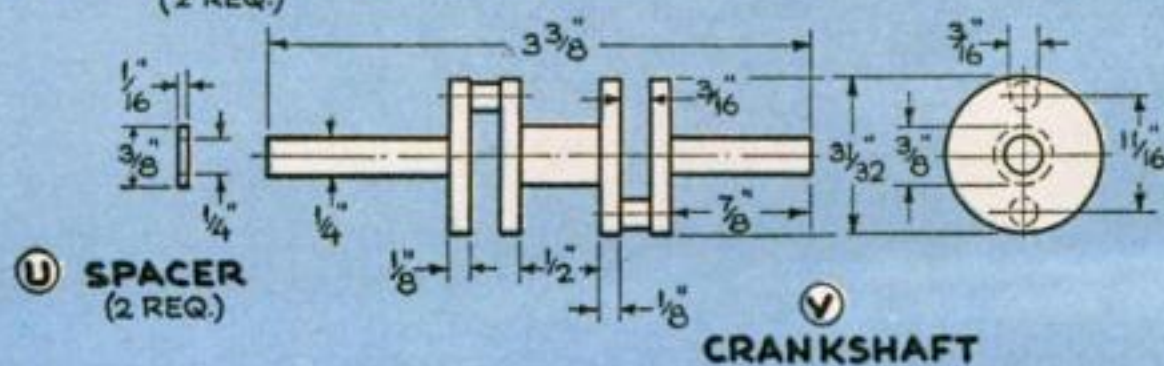
## ASSEMBLY



**⑤ CYLINDER-SUPPORT PLATE**

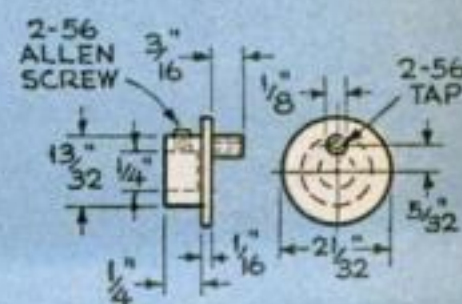


BASE



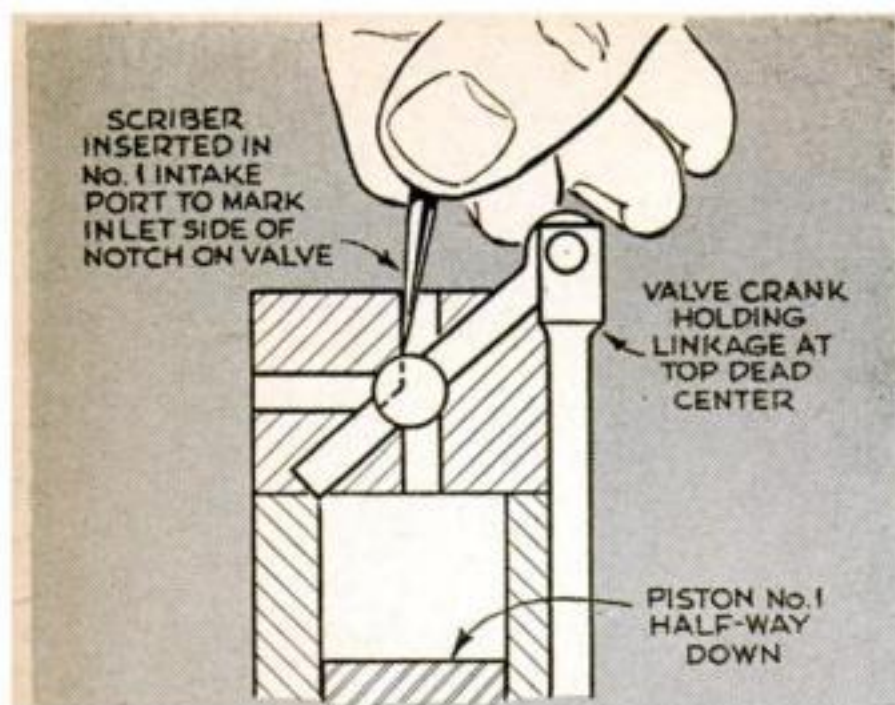
**U SPACER**  
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## CRANKSHAFT

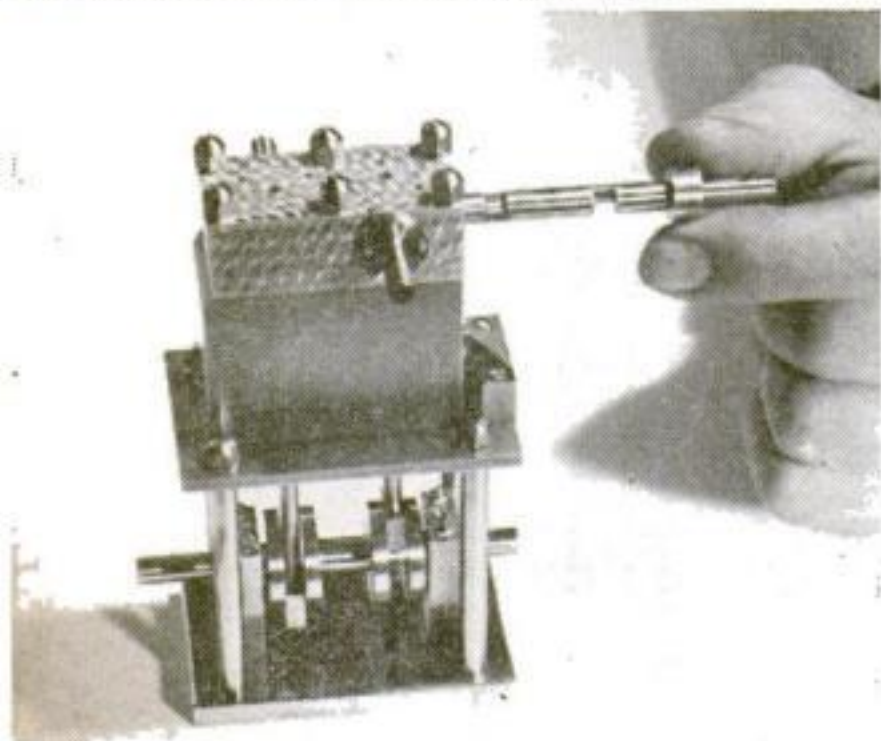


Ⓢ VALVE CRANK

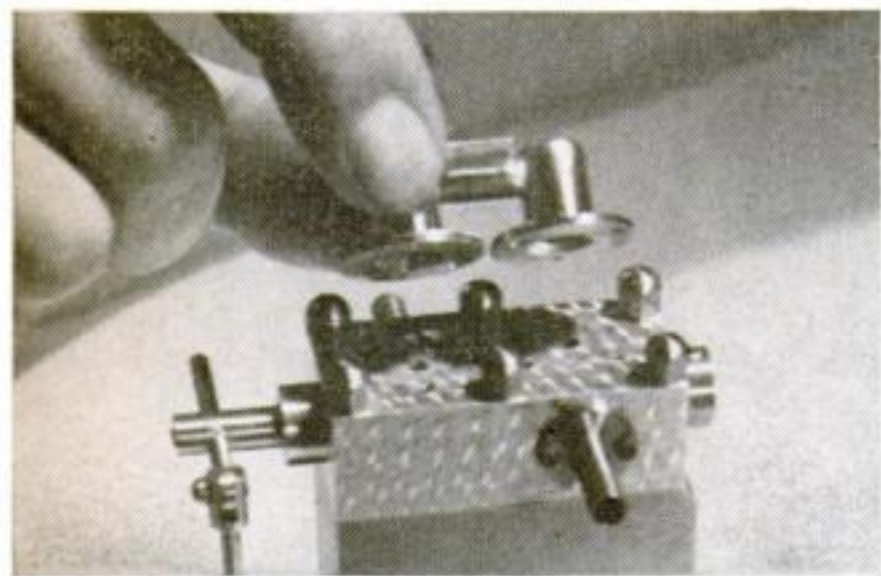




**TO LAY OUT PASSAGES** in rotary valve, insert scribe in No. 1 inlet port and No. 2 exhaust port with valve crank set at top dead center. Rotate crank to bottom dead center and mark valve through No. 1 exhaust port and No. 2 inlet port. File notches to shape indicated by dotted line, and try the valve frequently until the ports uncover, as illustrated here.



**ROTARY VALVE** reciprocates in an arc of less than 45 degrees to pass steam in and out of the cylinders through notches filed in line with inlet and exhaust ports. Collars locked on ends of the valve hold it in alignment.



**INLET MANIFOLD** is fastened to top of cylinder head with #2-56 machine screws. Gasket cut from oiled brown paper seals flanges against leaking. Simple flanged tube on each side of the cylinder head covers the exhaust ports.

filing the port passages in the valve rod. Make the valve crank from a short piece of  $\frac{5}{8}$ " steel rod. Turn the hub and mount it  $\frac{5}{32}$ " off center in the four-jaw chuck. Turn a  $\frac{1}{8}$ " crankpin on the face, leaving a flange about  $\frac{1}{16}$ " thick. The lower linkage rod can be cut from  $\frac{3}{16}$ " brass, then chucked and turned round. The center hole used to support the small end while turning the rod will later be used as an oil hole. Drill and ream the large end  $\frac{1}{8}$ " to fit the pin on the valve crank.

An idler arm between the linkage rods more than doubles the short throw of the valve crank. Turn the arm from  $\frac{3}{16}$ " square steel rod. Drill and ream a  $\frac{1}{8}$ " hole on one end to pivot on a brass bushing and file a clevis on the other end. A steel block bolted to the end of the cylinder base supports it.

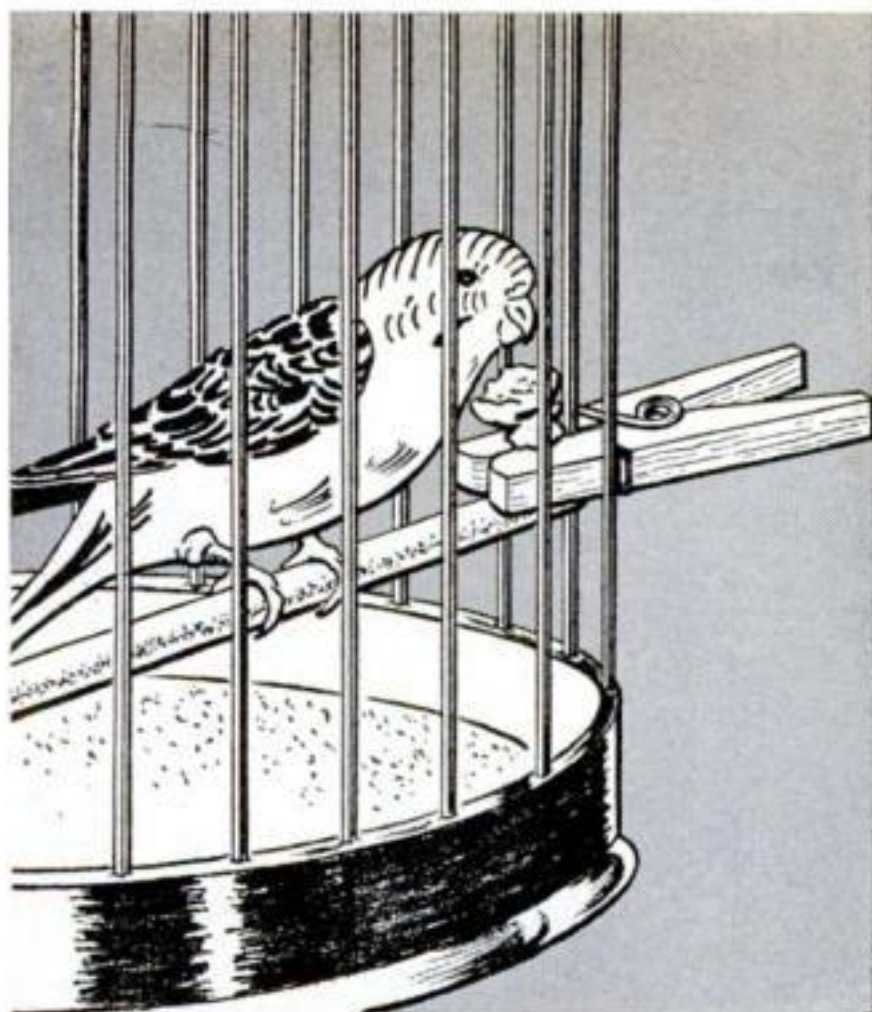
The upper rod can be turned from  $\frac{1}{4}$ " brass rod. File its bottom end flat and drill a  $\frac{1}{16}$ " hole for the idler-arm clevis pin. File a clevis in the rod's top end to receive the short pin that connects it to the valve rod. Drill a  $\frac{1}{8}$ " hole  $\frac{1}{4}$ " in from the end of the valve rod for the end of the connecting pin, and install an Allen setscrew in the rod end to lock it and permit slight adjustment. Turn two  $\frac{1}{2}$ " collars to fit on both ends of the valve rod and hold the rod in position.

**Port passages** in the rotary valve must be shaped by the file-and-try method. Lay out the passages at top and bottom dead center as illustrated; then file the passages in the valve, trying it frequently until it uncovers correctly at top and bottom dead center.

Machine the parts for the inlet manifold and join them with hard solder. Simple flanged tubes are used to exhaust steam. In a model, rubber tubing can be slipped on the exhaust tubes to carry the condensing steam overboard or to the stack on the boiler. Drill and tap #2-56 holes in the cylinder head to match the clearance holes drilled in the flanges of the exhaust tubes and fasten the manifold and tubes in position. Cut kraft-paper gaskets to fit under the head and manifold, and fasten them on.

Pour some diluted silver polish or toothpaste into the cylinders and rotate the crankshaft by hand to lap the pistons to a smooth fit. Wash out the polish and oil all the parts. Then hook the engine to the boiler for the test run. ■ ■





### Food Clip for Bird Cage

Most caged birds like bits of apple, fresh greens, or toast. If you simply wedge these treats between the bars, the bird often pecks them loose. To prevent this, insert a spring clothespin through the bars so that it rests on a perch, and place the tidbit in the jaws.—*Norman R. Joseph, Lynbrook, N. Y.*

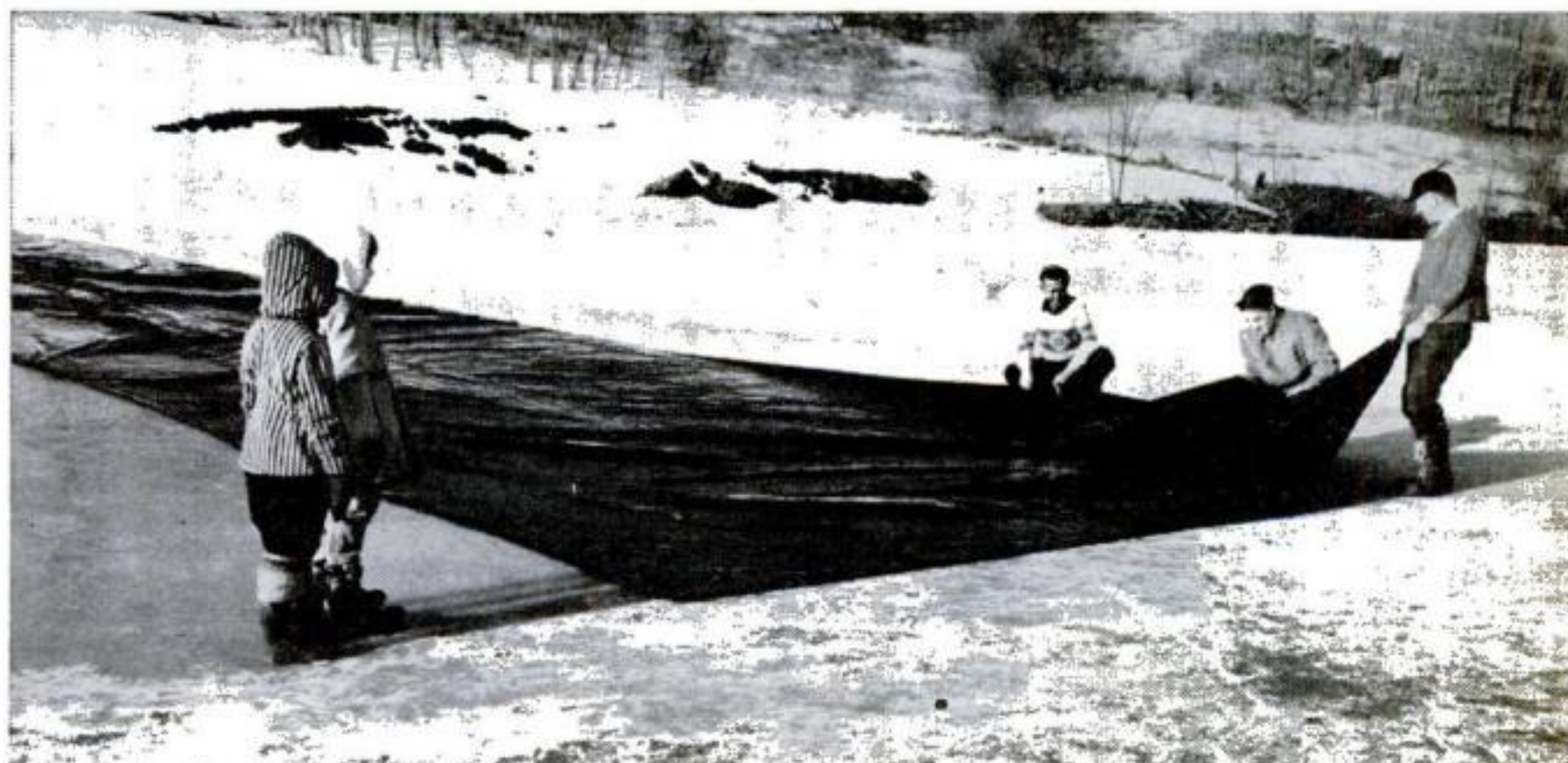
## Short Cuts and Tips

FROM PS READERS



### Homemade Chains for Snow

BANDS cut from a truck inner tube are used for extra snow traction by Sgt. G. A. Du Bois of Chanute Air Force Base, Ill. After looping three of them around the rear tires, he fastens each with a piece of wire. Du Bois says he's been able to plow through 18" of snow.—*William R. Kreh, Silver Spring, Md.*

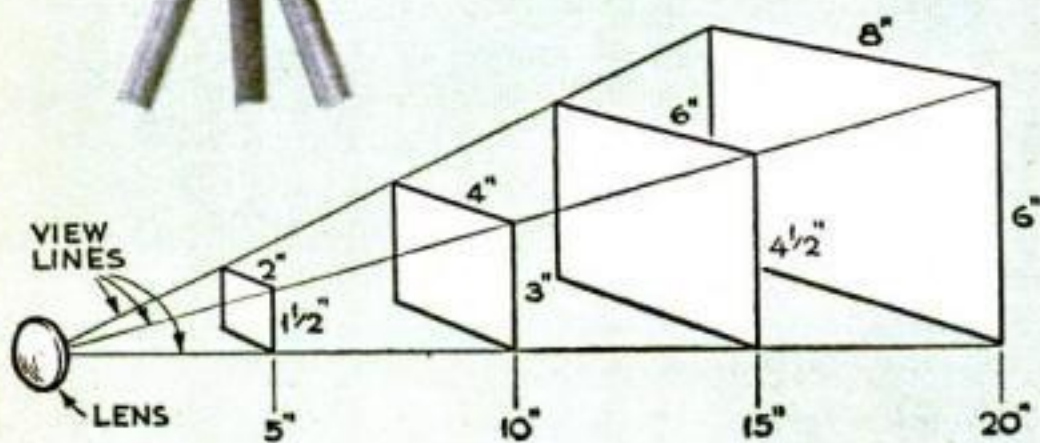
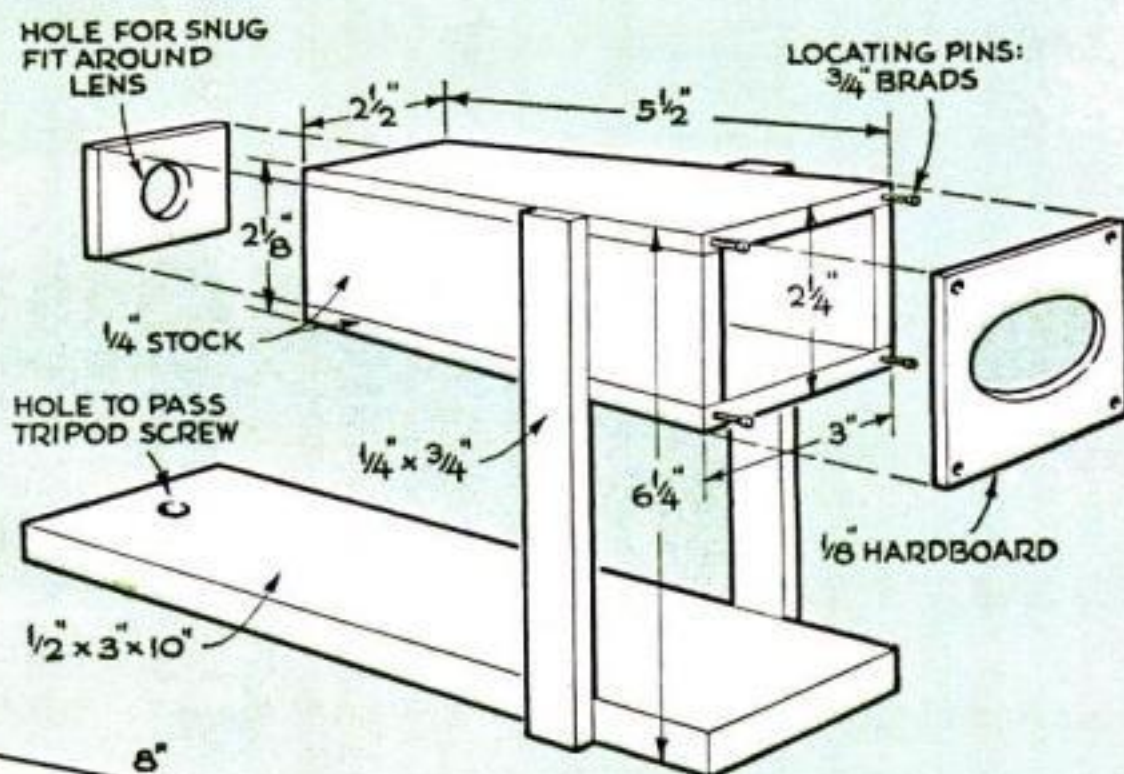
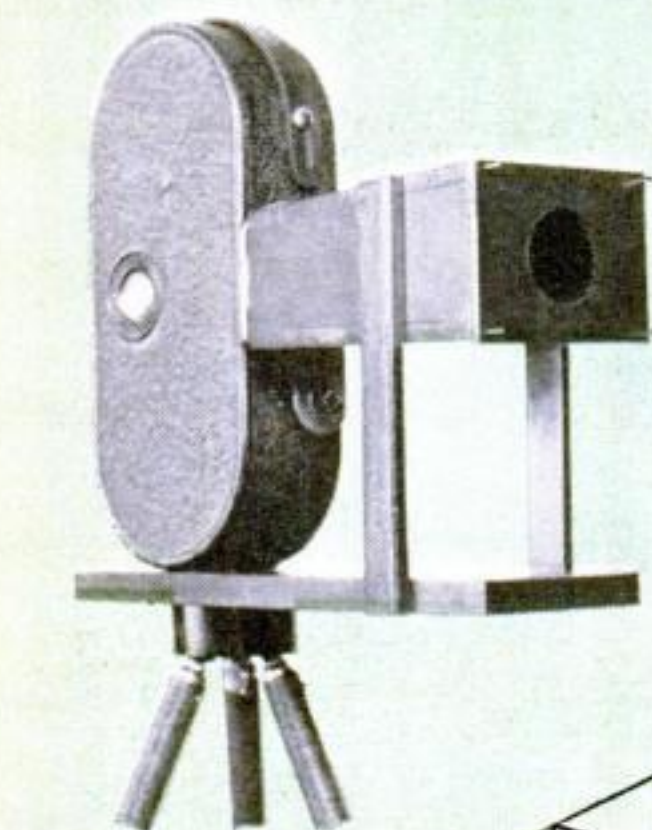


### Plastic Smooths Skaters' Ice

STUDENTS at Bennington College, Vt., are skating on smooth ice thanks to a scheme thought up by their biology professor, Fred Wohnus. Rough patches of ice are covered with large sheets of black polyethylene film. This absorbs heat from

the sun and melts the ice. When the sheets are removed, the ice refreezes with a smooth surface. The film, which cost the experimenters only \$16 for 1,600 square feet, raises temperatures in sunlight to as high as 60 to 70 degrees, reports Prof. Wohnus. The method is also said to fill cracks in the ice.





**DIMENSIONS ABOVE** are for author's 5½"-long box. You can alter them to suit your camera. Diagram at left gives approximate fields of view at various distances from normal movie lens. Matte end of box must be larger so edges of scene aren't covered when you shoot without a cutout mask.



# Matte Box for a Movie Camera

By James R. Oswald

LIKE all pictures, a movie scene looks best in a frame. But you seldom have the opportunity to shoot through an archway or a ship's porthole. Normally, your camera limits you to a standard rectangle, the height of which is  $\frac{3}{4}$  of the width. Build this simple matte box, however, and you can control the size and shape of the picture for a variety of special effects.

A matte box is a square, light-tight tube you slip over the lens at the time of filming. The closed end has a hole into which the lens fits snugly; the open end serves as a holder for various cutout mattes, or masks, which silhouette the subject in a black frame. The box can be rectangular, or of the tapering design I used. The taper reduces the bulk and makes a neater fit at the lens, but it involves beveling the edges for light-tight joints. The box can be tailor-made for your movie camera only, or constructed for use with your still camera, as well.

**What length is best?** In deciding this, you'll have to weigh compactness and ease of handling against the fact that the farther the mattes are from the film plane, the more defined (less fuzzy) the edges of the cutout will appear on the screen.

Cut the mattes from a material that's easily worked to a smooth edge: Any imperfection in the outline of the cutout will be magnified many times when the film is projected. Small holes in the corners align with four locating pins to provide quick positioning when switching mattes.

The effectiveness of a matte box depends on its ability to produce an opaque frame. The more snugly the box fits the lens, and the mattes their window at the front, the less chance there is for light leaks. Coat the inside of the box and both sides of each matte with flat black paint.

Proper exposure and framing will require a little experimentation. I'd recommend an increase of a full stop over normal exposure, to compensate for any light-reducing effect—particularly when the cutouts are small.



## Putting Cup for Indoor Golf

FLATTEN one side of a heavy plastic drinking glass, using a file or power sander, to make a practice cup for floor putting. The inside taper rolls the ball back out for easy retrieving.

If you can find an extra-heavy tumbler with thick walls, you can file three sides. Then, if the cup tips up when you sink a putt, it will always land flat, ready for action again.—*John Metcalfe, Port Jervis, N. Y.*

## Helmet Headband from Belt

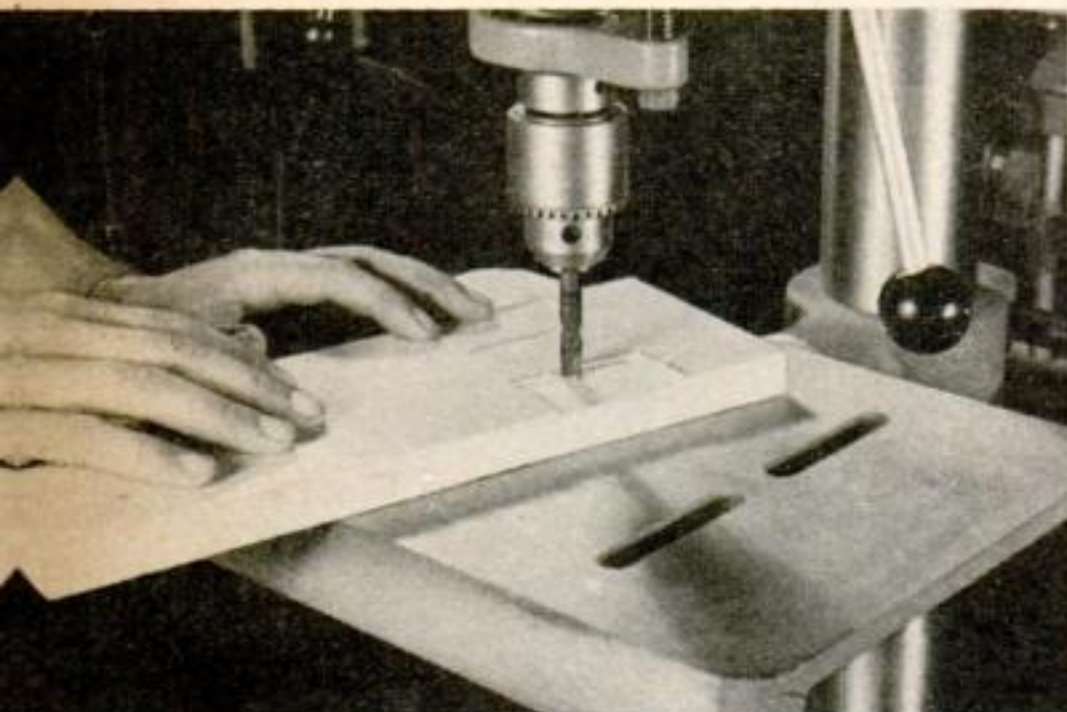
IT DOESN'T take long for perspiration and heat to distort the hard-fiber headband furnished with most welding helmets of the type shown.

An old belt makes a soft, comfortable replacement that you can tailor to fit your head. If the helmet is to be used by others, keep the buckle so the band can be adjusted. — *W. G. Waggoner, Sacramento, Calif.*

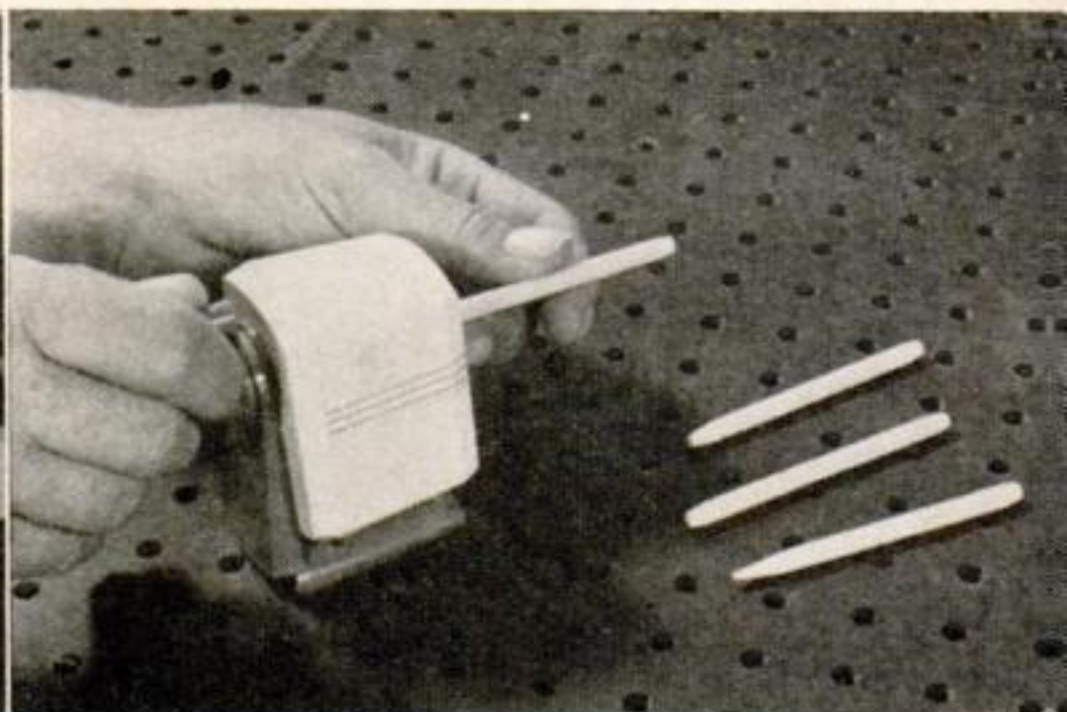




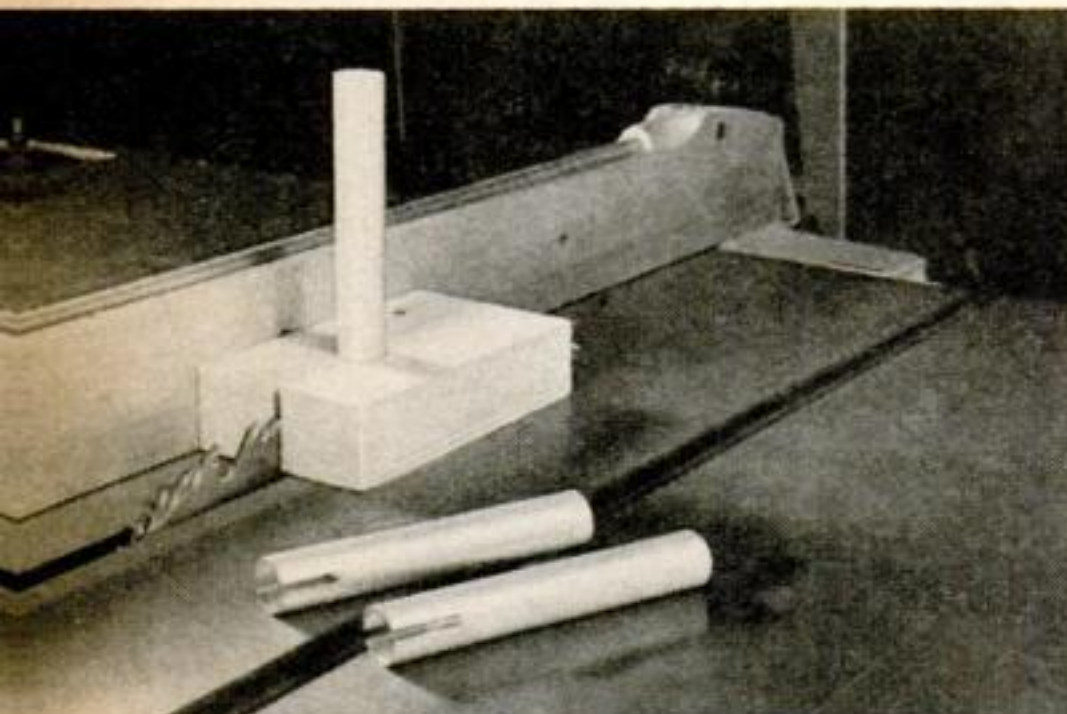
# Woodworking Tips for the Home Shop



**BROKEN DRILL AS ROUTER BIT.** A broken twist drill makes a respectable router bit. All you have to do is square off the broken end on a grinding wheel. Use at router-bit speeds.

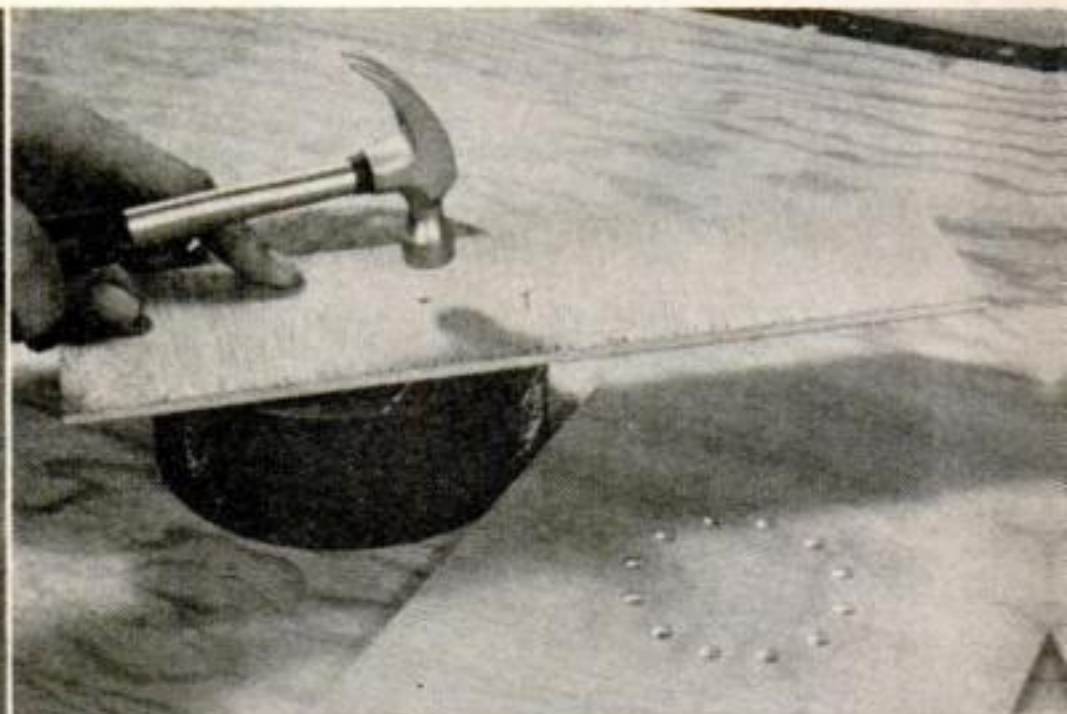


**DOWEL TOOL.** A pencil sharpener does a good job of pointing dowels or chamfering the ends of wooden pins for use in a glue joint. Dowels up to 5/16" go in a one-hole sharpener.



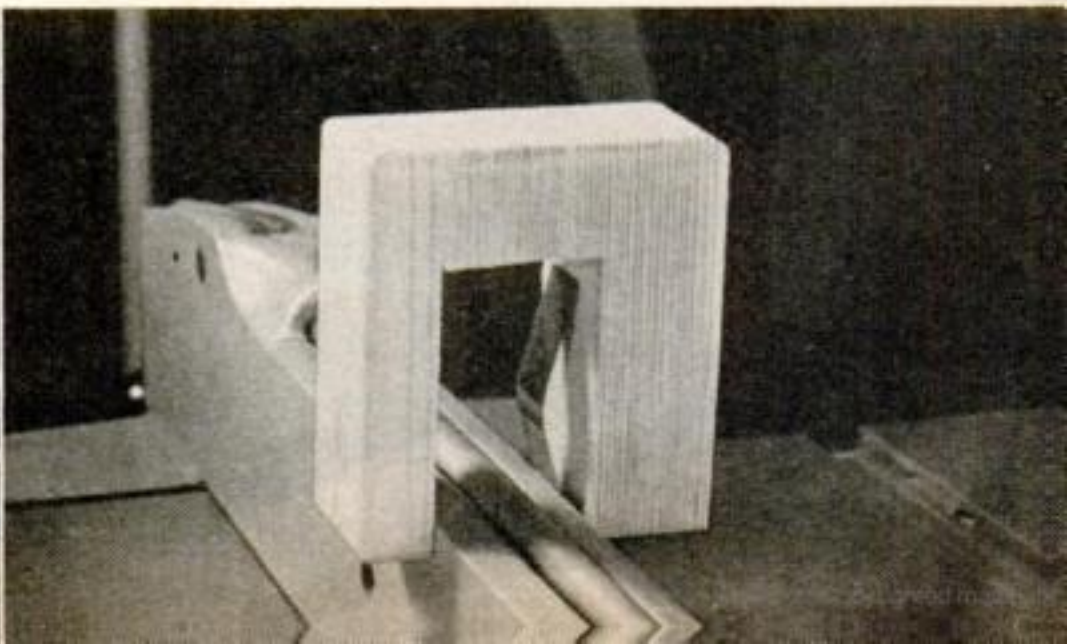
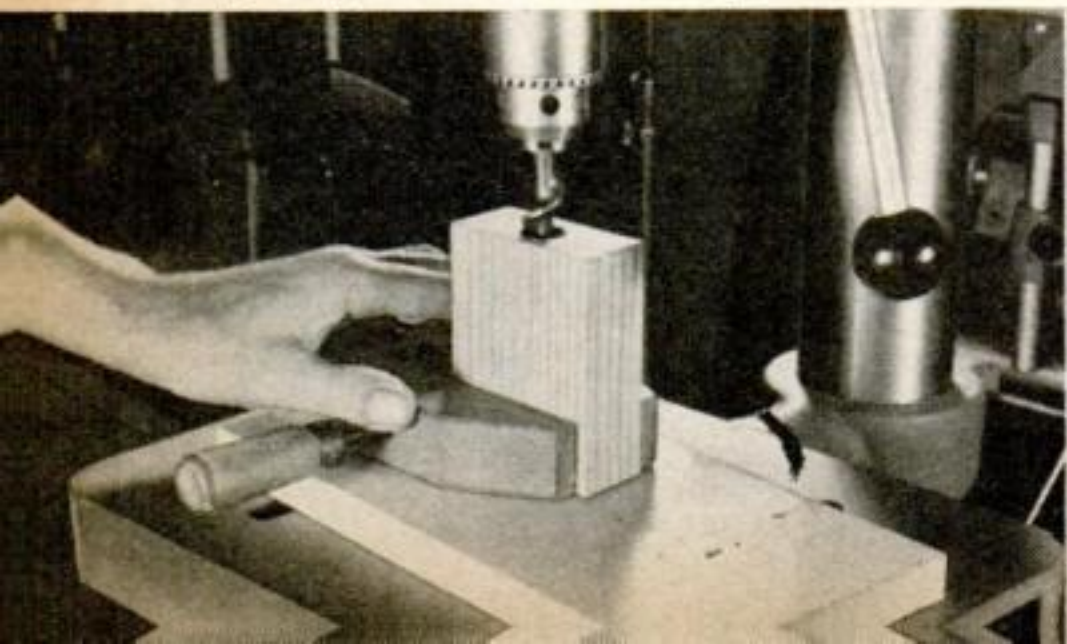
**SLOTting TUBES OR DOWELS.** Drill a wood block to take the work. Then form a kerf through the hole center. Place the work in hole and pass block and work into saw blade.

**AN ORDINARY SCREW CLAMP** does a good job of holding drill-press work that is too small to hold safely in your hand. The clamp will also help keep the work flat and square.

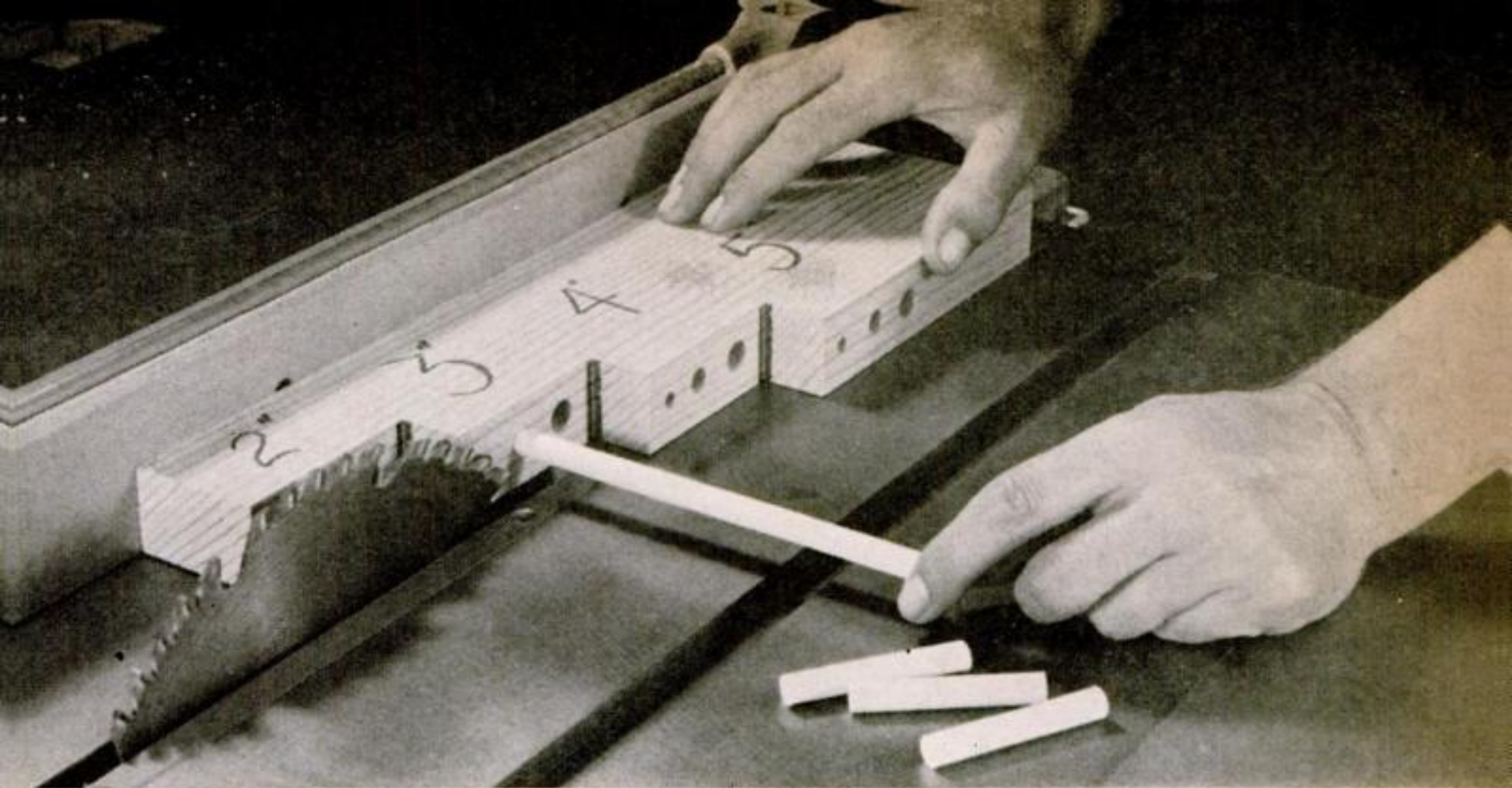


**SOFT ALUMINUM RIVETS** can be used to decorate wood projects. Set with a hammer and steel backing block. For a flush surface in hardwood, countersink the hole in the wood first.

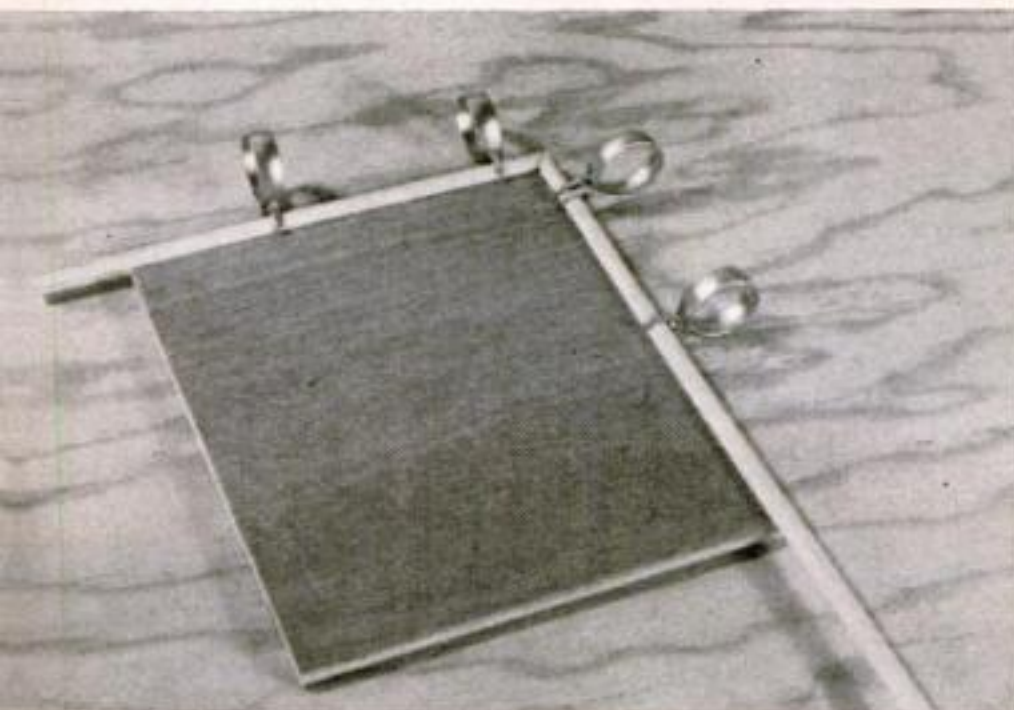
**RIP-FENCE STOP BLOCK.** Cut opening 1/16" wider than fence. Bend and install a piece of heavy clock spring so block will fit tightly on fence. Nail spring to the underside of block.





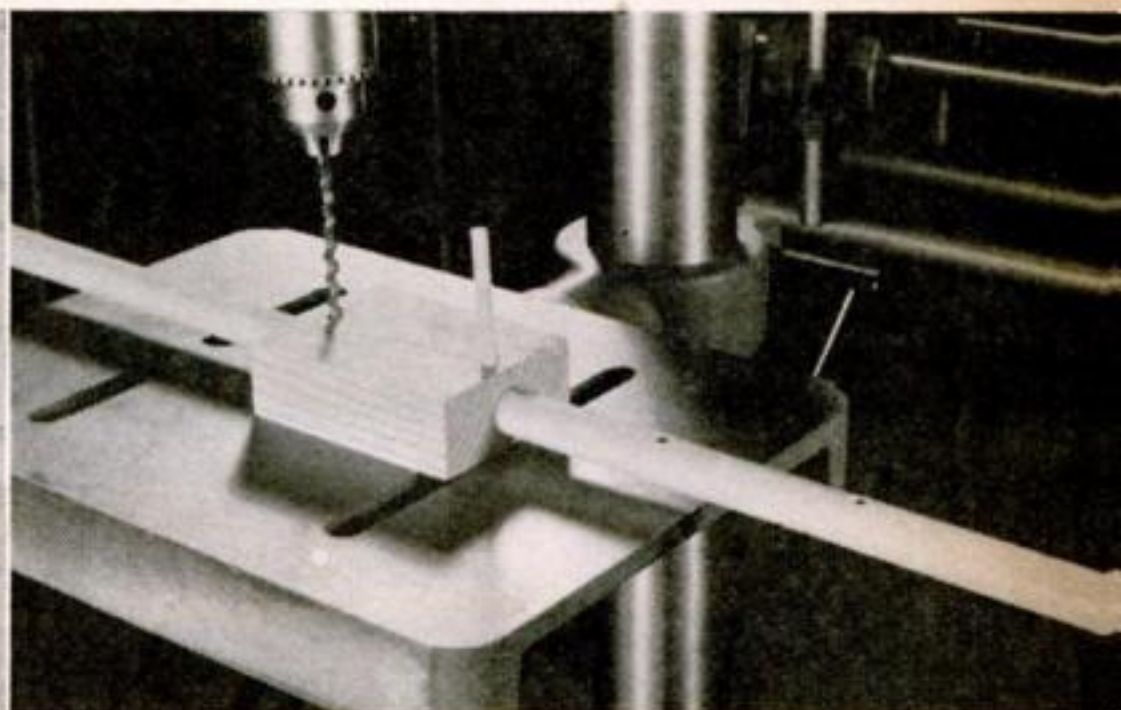


**STEP JIG FOR DOWELS.** So that you can quickly cut a dowel to length, make this step jig from a two-by-six. Each step gives you a specific length. Holes, which go through stock, here are for  $\frac{1}{4}$ ",  $\frac{3}{8}$ ", and  $\frac{1}{2}$ " dowels. You can provide others by making the steps longer.



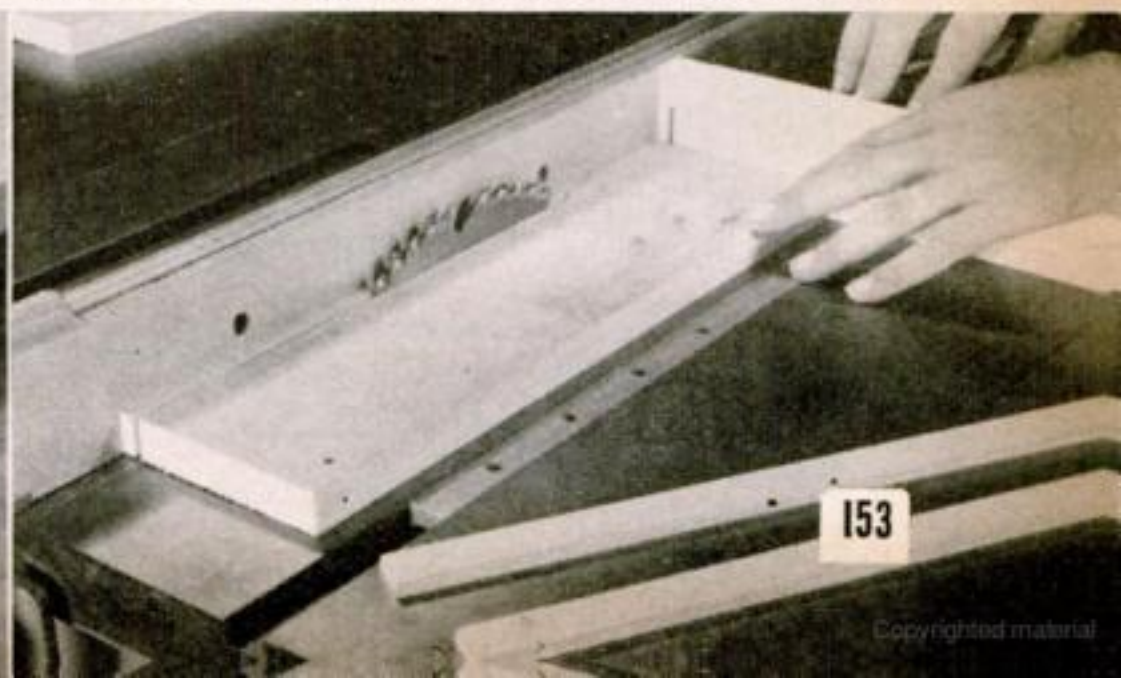
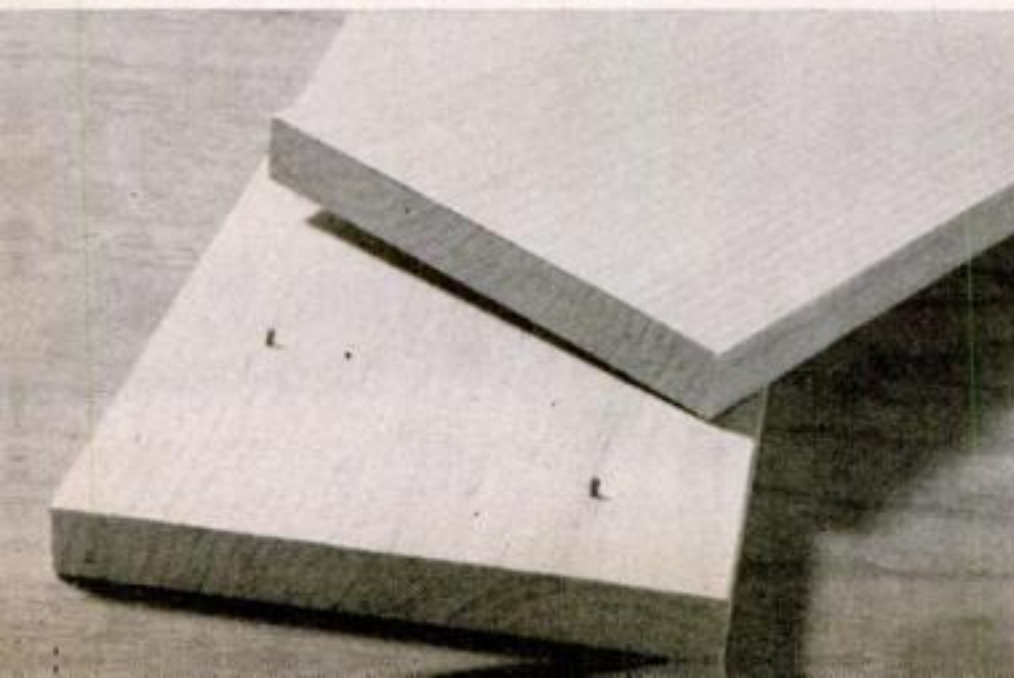
**DRAPERY RINGS** that grip with a spring action can usually be used for a light clamping job. Some are hooked to grip the cloth. Bend the hooks flat with a pair of pliers.

**BRADS—GLUING HELP.** To keep glue-wet boards aligned as you apply clamp pressure, drive a few brads into one piece and snip the heads off. The two pieces stay married.



**SPACING HOLES IN DOWELS.** This jig will provide correct spacing and keep the holes in same plane. Insert the jig pin in each drilled hole to position dowel for the next hole.

**CUTTING SLIM STRIPS.** Attach an extension to the miter gauge as shown. Lock the rip fence to set the strip thickness and butt the extension against the fence before screwing it to gauge.





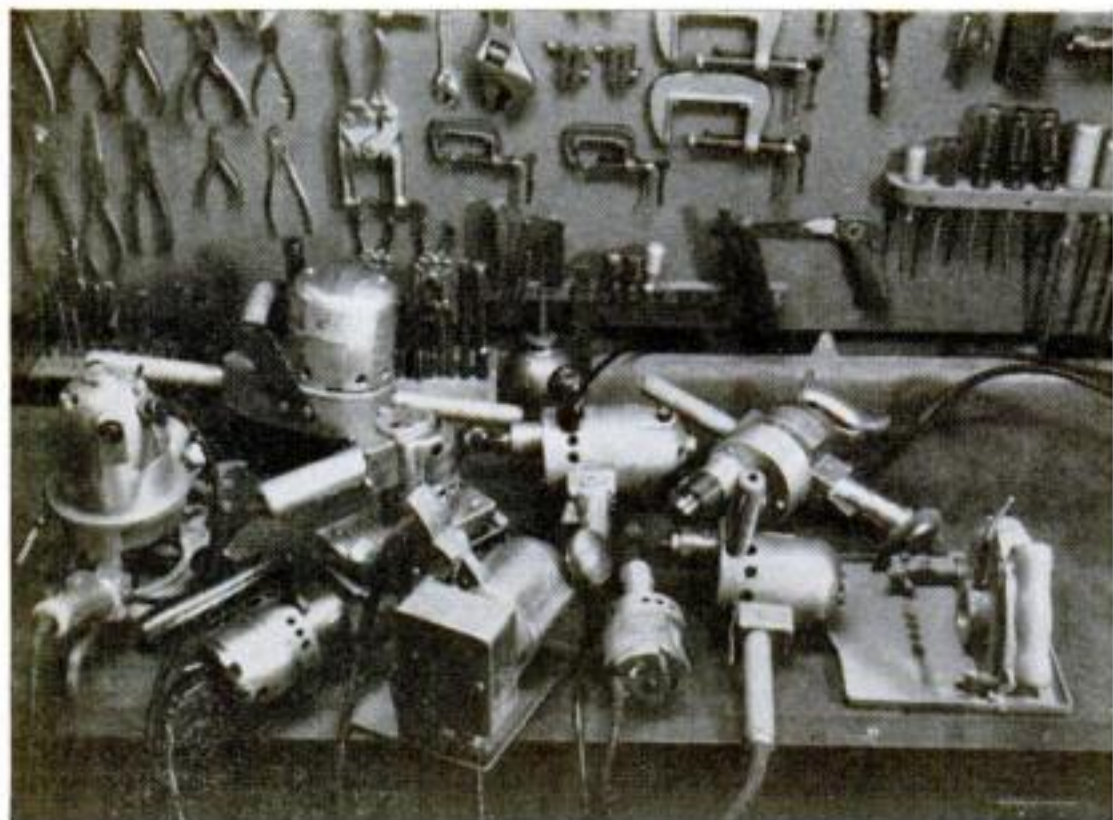
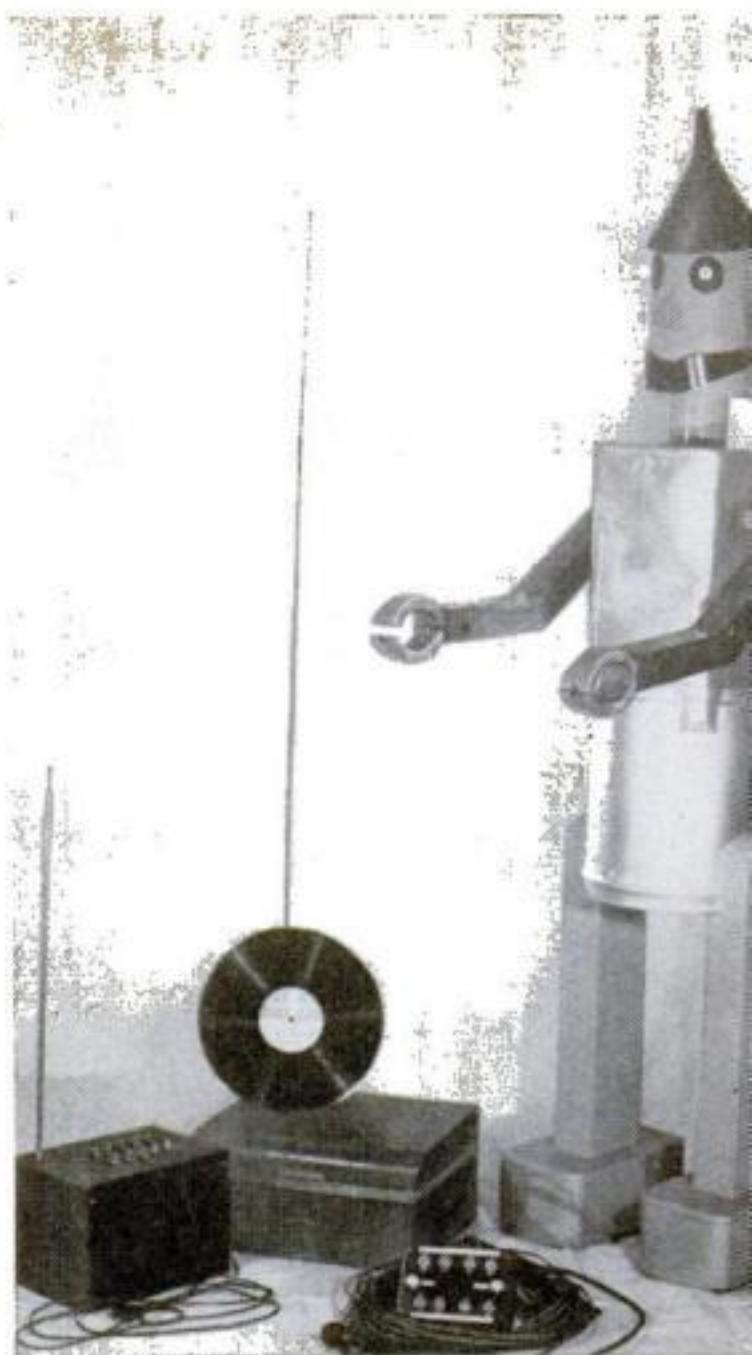
# My PRIZE project is...

## ...a radio-controlled robot

WORKING from my own blueprints, I spent my last three years of high school—and about \$100—on the construction of a robot that's six feet tall and answers to the name George.

By manipulating either a switchboard (bottom center of photo at right) that plugs into the robot, or an eight-channel remote-control system (far left) that activates the circuits at distances up to 300 feet, I can make George move forward, raise his arms, open his claw hands, turn his head, blink his eyes, tip his hat, move his mouth—and even talk. George's voice comes from a radio receiver, inside, which picks up a signal from a transmitter wired to a phonograph playing recorded comments (center). He, alas, puts his talents to no practical use.

EDWARD J. GUTMAN, Cleveland Heights, Ohio.



## ...a portable power-tool set

NOT one of the tools on the bench top above was purchased. I made all 10, using vacuum-cleaner motors, antifriction bearings, and aluminum housings I cast myself.

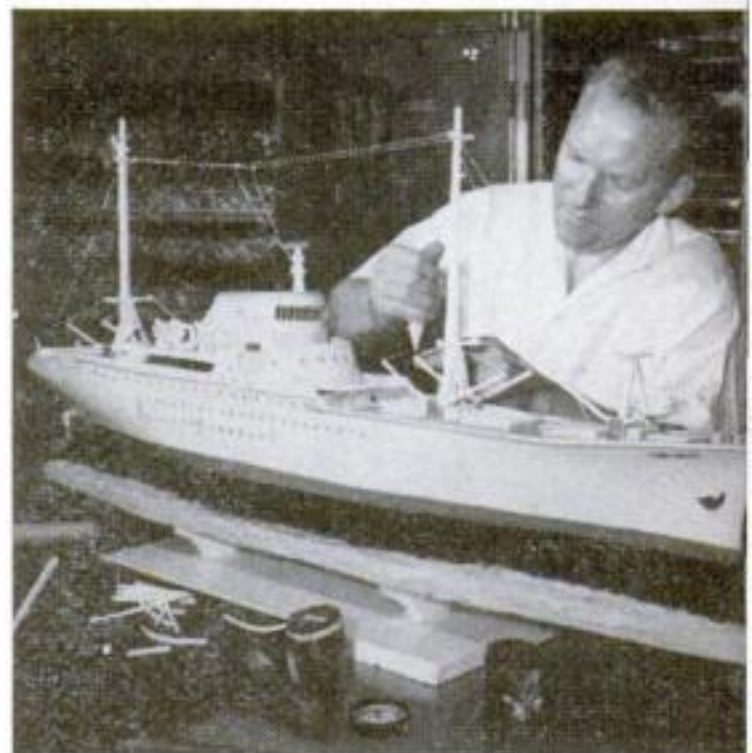
Clockwise, from far left: router, power unit, disk sander,  $\frac{1}{2}$ " drill, circular-saw attachment ( $6\frac{1}{2}$ " blade) for sander, light-duty sander drill (2,600 r.p.m.), saber saw, hedge trimmer, orbital sander. Besides economy, the motors have this advantage: Since they don't need powerful cooling fans, they eliminate that sirenlike scream that you are forced to endure with many commercial units.

J. E. BROWN, Culver City, Calif.

## ...a sweet ship model

BET you never expected an *edible* model to be made from your Savannah plans (Dec. '60). I'm a professional baker. Instead of plastic and wood, I cast powdered sugar (and a special binder) in a mold to form the four-foot hull. The model made quite a hit when displayed at a recent convention of my union.

EGON LARSEN, The Bronx, N.Y.





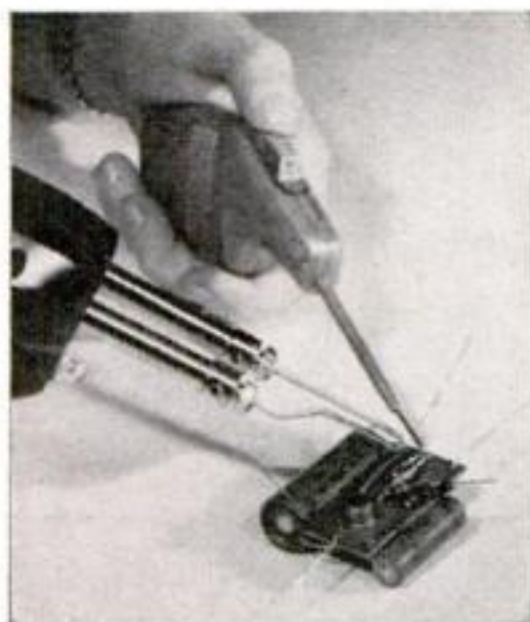
# HOME SHOP

## news report

By Sheldon M. Gallager

**Furniture finishes removed while you wait.** Here's good news for those who like to refinish their own furniture but don't like the backbreaking job of removing the old finish first. A new service springing up across the country will take your old paint- or varnish-encrusted pieces and strip them bare for you.

The furniture laundries, started in Kansas City, Mo., by the Bix Service Co., are already in 43 cities and are said to be spreading to others at the rate of four or five a month. As part of the service, Bix also gives you complete step-by-step refinishing instructions along with each de-finished piece.



**Smart idea: a dispenser for solder.**

Buyers of new Weller soldering guns will get a neat plastic dispenser that lets you feed solder smoothly with one hand while holding the gun with the other. Ten feet of wire solder can be stored on a spool inside, or large coils can be threaded through the dispenser and allowed to trail out the back for a continuous supply. Pressing a thumb trigger pushes the solder out the tip a bit at a time. Dispenser and 100-watt gun normally cost about \$6 each, sell together for \$9.95—a nice saving—from Weller Electric Corp., Easton, Pa.

**What's your wood I.Q.?** So that you may test yourself and your friends—and maybe learn some interesting facts about wood, as well—the National Lumber Manufacturers Association has prepared the following quiz. A score of five right is good; all eight right makes you an expert. Answers on the next page.

1. About one million board feet of lumber were used at last January's presidential inauguration to build temporary seating for some 20,000 spectators. How many average-size homes could be built from this much wood? 25? 75? 100? 250?
2. What is a "kissing bridge"?
3. An ancient wood floor, probably the world's oldest, was recently discovered in the tomb of one of Egypt's first Pharaohs. Can you guess its age? 2,000 years? 5,000? 10,000?
4. U. S. forests are gradually dwindling: true or false?
5. What holds up the Brooklyn Bridge?
6. Where is the world's largest wooden building located? Japan? United States? Germany? China?
7. Approximately how old is a piece of petrified wood? 10 million years? 50 million? 150 million? 300 million?
8. How many species of wood of commercial value are grown in the U. S.? 10? 50? 100? 1,000?

**Biggest do-it-yourself kit** now on the market is said to be the Schober electronic organ, which comes, like a hi-fi kit, complete

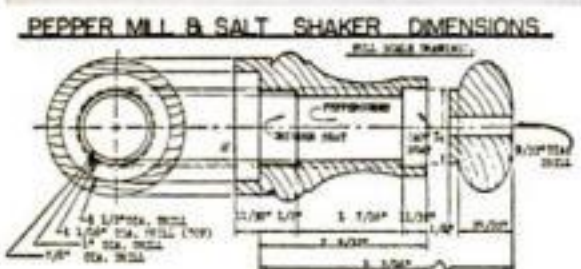
CONTINUED



with all parts and step-by-step assembly instructions. Three models, from a church-size giant to a small home spinet, range from about \$550 to \$1,200. Average construction time is about 100 to 200 hours. They're *not* a one-evening project.

**Like to tinker with your electric shaver?** It will be easier now if you own a Sunbeam. The Chicago firm plans to sell replacement parts for its shavers in drug and variety stores—just like regular razor blades. First to come will be comb-and-cutter sets (about \$4 for single-blade shavers and \$5.75 for three-bladers).

**Novel lathe project.** You can have the fun of turning your own pepper mill and matching salt shaker, while a kit supplies the difficult hardware. The kit, shown at left, includes the grinder mechanism and fittings, plus a metal cap and rubber stopper for the companion salt shaker. The wood bodies can be turned from your own design or from plans also included in the kit, as shown in the sketch. You can get a kit for a 4"-tall set for \$2.98 or an 8"-style for \$3.25 from Peppermill Kits, 1972 Fullerton Ave., Costa Mesa, Calif.



**New no-rub wood finishes.** U. S. Plywood's famous wild-grain-taming Firzite is back again in a new form. Called Weldwood Deep Finish Firzite, the simple flow-on, wipe-off, clear sealer-finish is designed to give the beauty of a 20-coat, hand-rubbed Danish finish without the elbow-busting armwork. For use on both furniture and floors, it toughens wood fibers and dries to a deep luster. Price is about \$2 a quart. For tips on using it, write

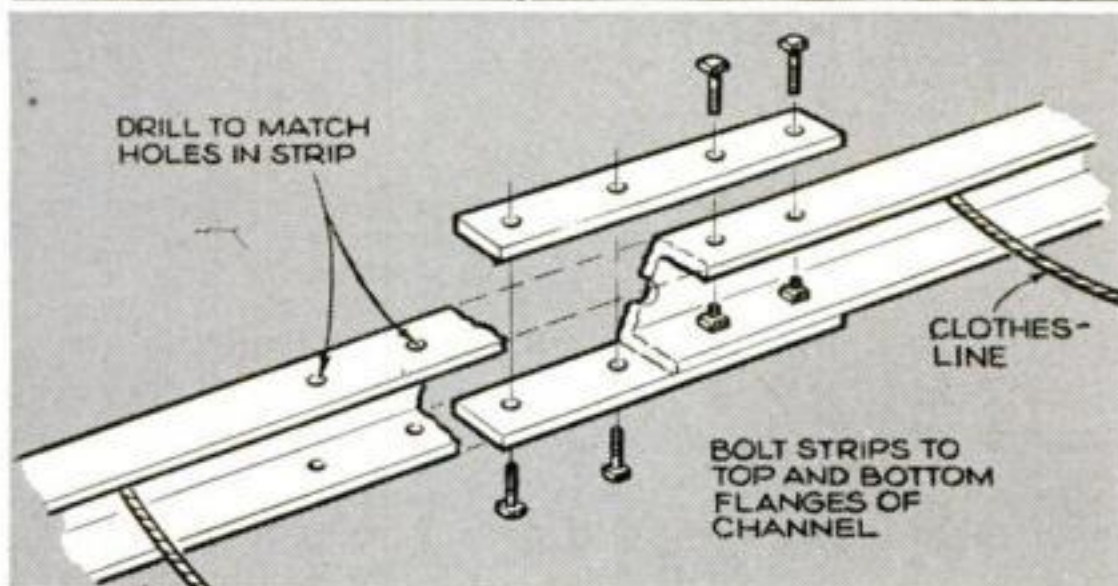
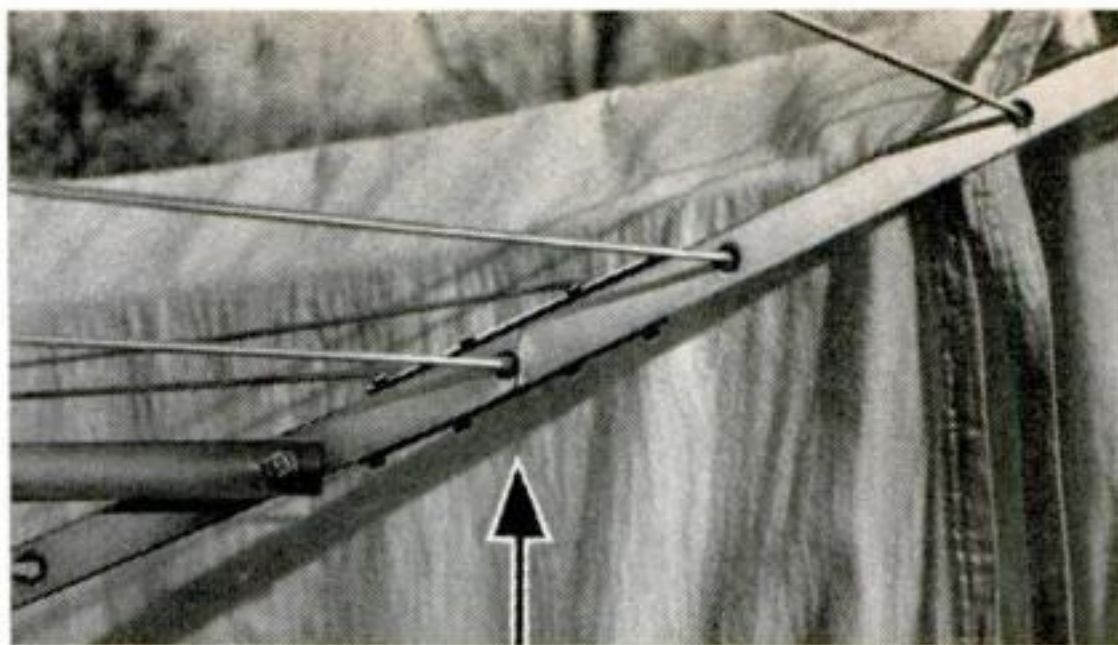
to U. S. Plywood, 55 W. 44th St., NYC, for a free new booklet, "Professional Gluing and Wood Finishing Guide."

Another all-purpose floor-furniture finish comes from William Zinsser & Co., 516 W. 59th St., NYC—the people who recently revolutionized shellac by bottling the stuff in pushbutton spray cans. The new finish, called Target, is a two-part formula—a base varnish and a chemical hardener. The tough, almost colorless film dries so fast it can be second-coated in three hours, walked on in six. About \$8 a gallon.

**Did you know?** Handy pushbutton products for shop convenience now include a spray-on slide lubricant, degreaser and cleaner, rust-penetrator, antirust oil, and brush softener. They're \$1.39 each from Stanley Tools, New Britain, Conn.

**Answers to the wood quiz.** 1. About 100. There are approximately 10,000 board feet of lumber in the average home. 2. The excellent privacy afforded by the old wooden covered bridge led to this revealing nickname. 3. 5,000 years—and still in good condition. 4. False. Timber growth in the U. S. exceeds timber cut by about one-third. 5. The giant 78-year-old span rests on wood pilings. 6. In Nara, Japan. It's known as the Daibutsuden of the Todaiji Temple. Wood's elasticity helps protect it from earthquake damage. 7. 150 million years. 8. About 100.



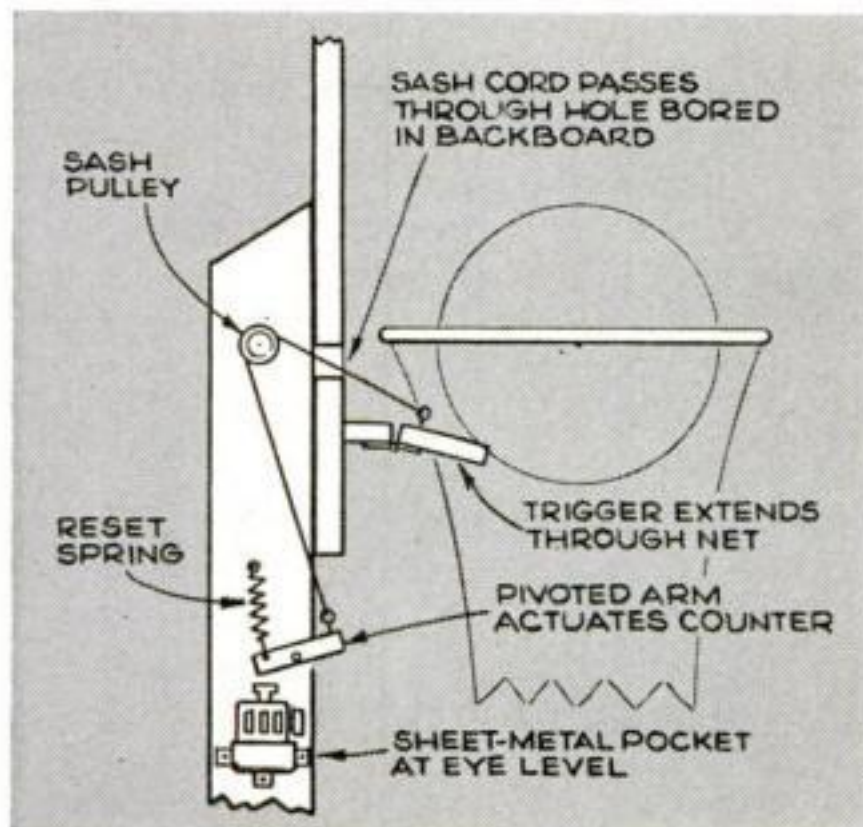


## Short Cuts and Tips

FROM PS READERS

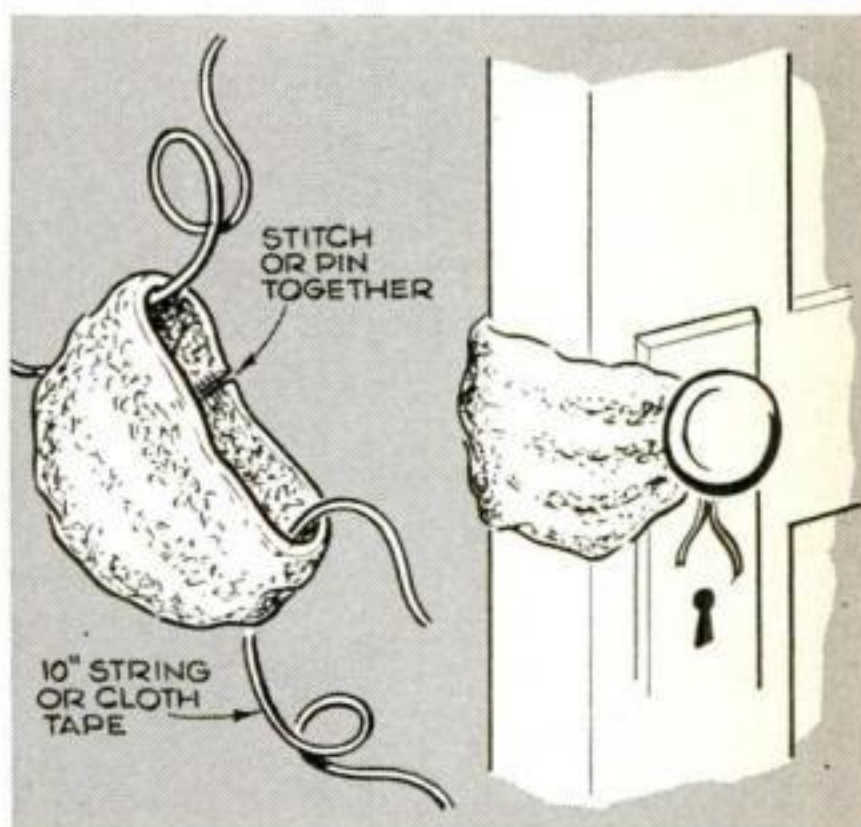
### Metal Splints Fix Broken Arm of Dryer

AN ARM of our umbrella clothes dryer broke off across one of the guide holes for the rope. I spliced it back together with perforated steel strips from my child's construction set. The arm was a metal channel so I bolted a strip to both the top and bottom flanges after drilling them to match the holes in the strip. I brushed on a coat of aluminum paint to keep the perforated splints from rusting.—R. C. Blatt, Larchmont, N. Y.



### Counter for Basketball Goal

SHOOTING baskets is a skill that requires much practice, yet unless some count is kept of the successful tries it is difficult to gauge your progress. A counting device, hooked up to the goal as shown, provides an accurate record. Keep track mentally of 100 throws, then check the counter for the number of baskets made. Record this before you reset the dial to zero. Try to improve your score in each successive 100-throw session.—W. C. Wilhite, Carlinville, Ill.



### Latch Mask Quiets Door

SILENCE a noisy door to a sickroom or a nursery by tying on a terrycloth sling. Fold a piece of toweling or a washcloth and fasten two edges to form a "muff" measuring about 4" by 5". Pass a short length of string or cloth tape through at each side and tie the ends around the doorknobs, stretching the cloth across the latch. The door will close but won't slam or click. When the silencer is no longer needed, it's a simple matter to remove it.—F. C. Gardner, San Angelo, Tex.



# Tips for Draftsmen

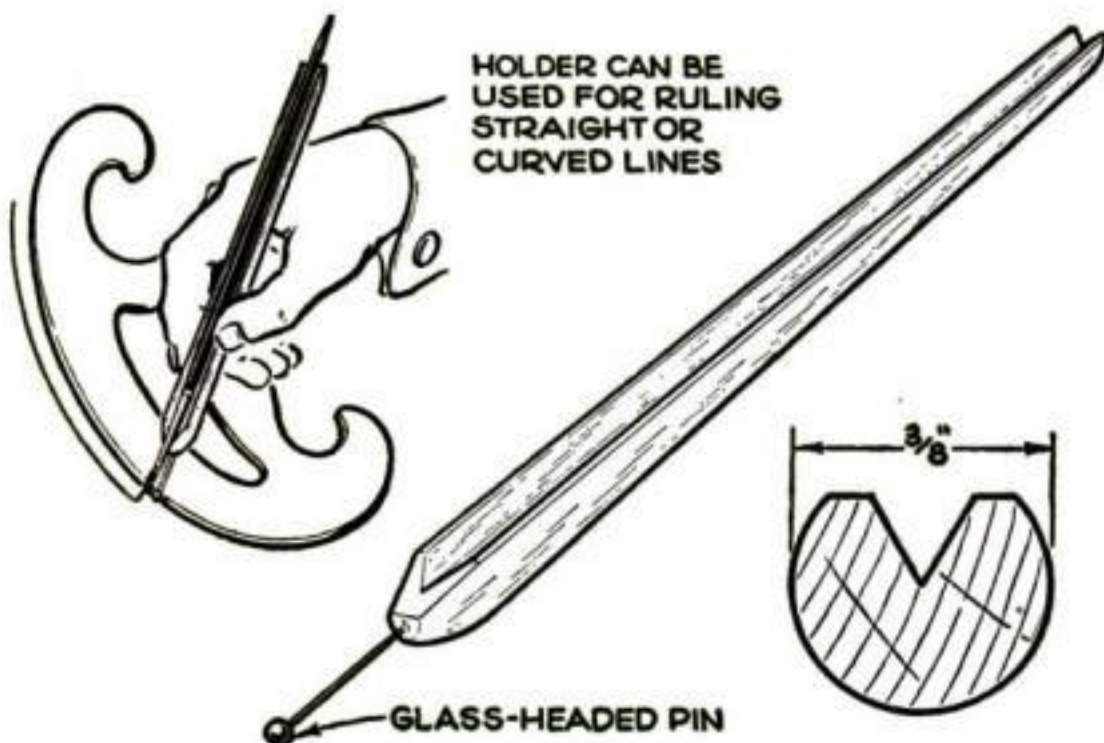


**Ruling lines with a brush** is easier with a homemade holder for the brush. Shape a pen-size piece of wood and groove it to receive a designer's or lettering brush. At the bristle end of the holder insert a ball-headed pin to ride against the guiding edge of ruler, French curve, or

▶▶▶ **CLOTH** adhesive tape cut into small pieces will hold paper securely on your drawing board, and you can forget about using tacks (with the resulting holes). The tape tabs can be removed from the board and paper by peeling them off slowly.—*Walter Fehlberg, La Crosse, Wis.*

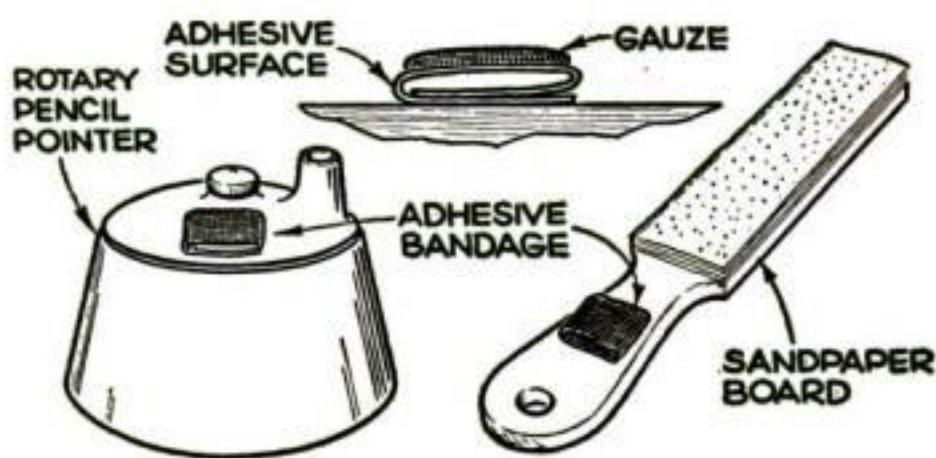


**A holder-sharpener** is easily assembled as you see here. Snip out about a third of the lid of a half-pound tobacco tin. Mount a dime-store sharpener on a wooden block with three screws as shown. Drill or cut a small hole in the center of the lid and position the sharpener under this hole. Run two wood screws down through the lid into the block.—*Norman Fried, Los Angeles.*



template. Cradle the brush in the groove with its tip even with the ball, grasping brush and holder as a unit. Make two or three holders with grooves of varying size to take different-sized brushes. Pressure will also alter thickness of line.—*H. A. Fluchere, Irvington, N.Y.*

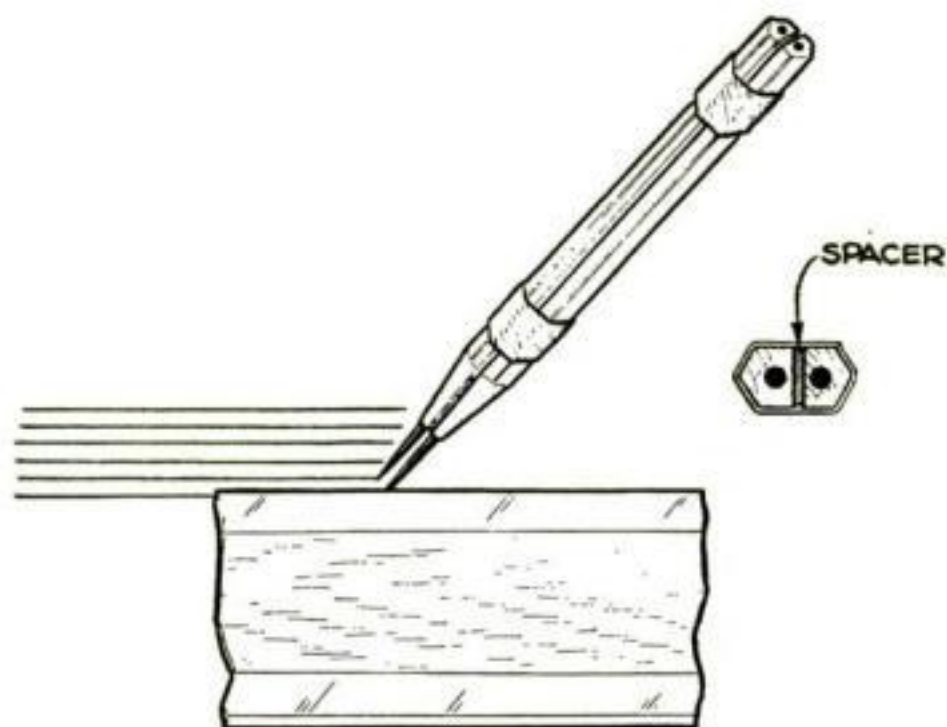
▶▶▶ **IN USING** the squared method of enlarging a drawing, use a soft lead to make the squares and a hard lead for the drawing. When the drawing is complete, a brisk rubbing with gum will whisk away the squares but leave the drawing.—*Charles Carroll, Marion, Ohio.*



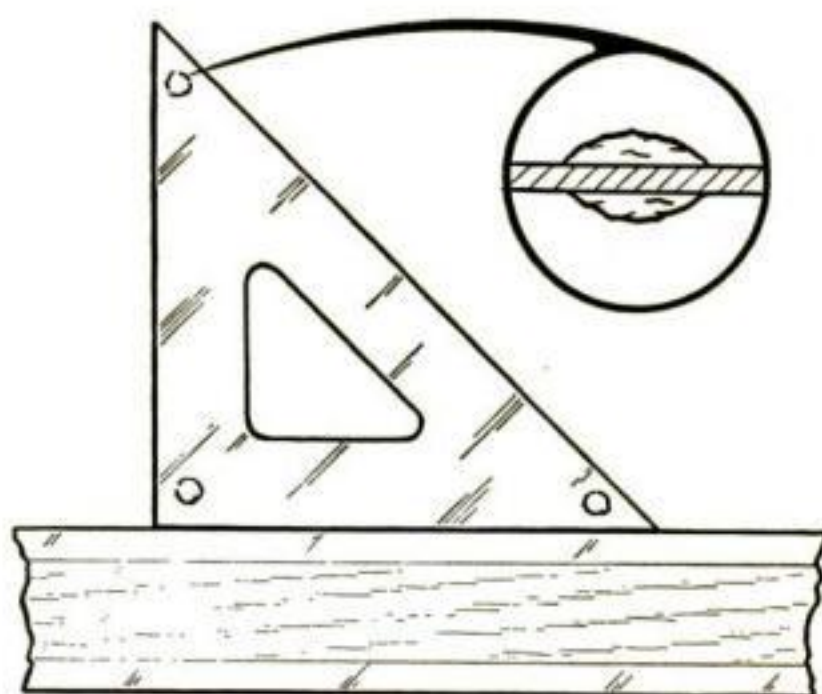
**Smudgy carbon dust** that remains on the point after a drafting pencil is sharpened can be removed with a convenient wiper made from an adhesive bandage about 1" wide. Fold the adhesive surface back on itself and stick it to the sharpener or sanding board. Another pad placed on or near an ink bottle can be used to wipe away excess ink from a pen.—*Harry O. Wicks III, Hamburg, N.Y.*



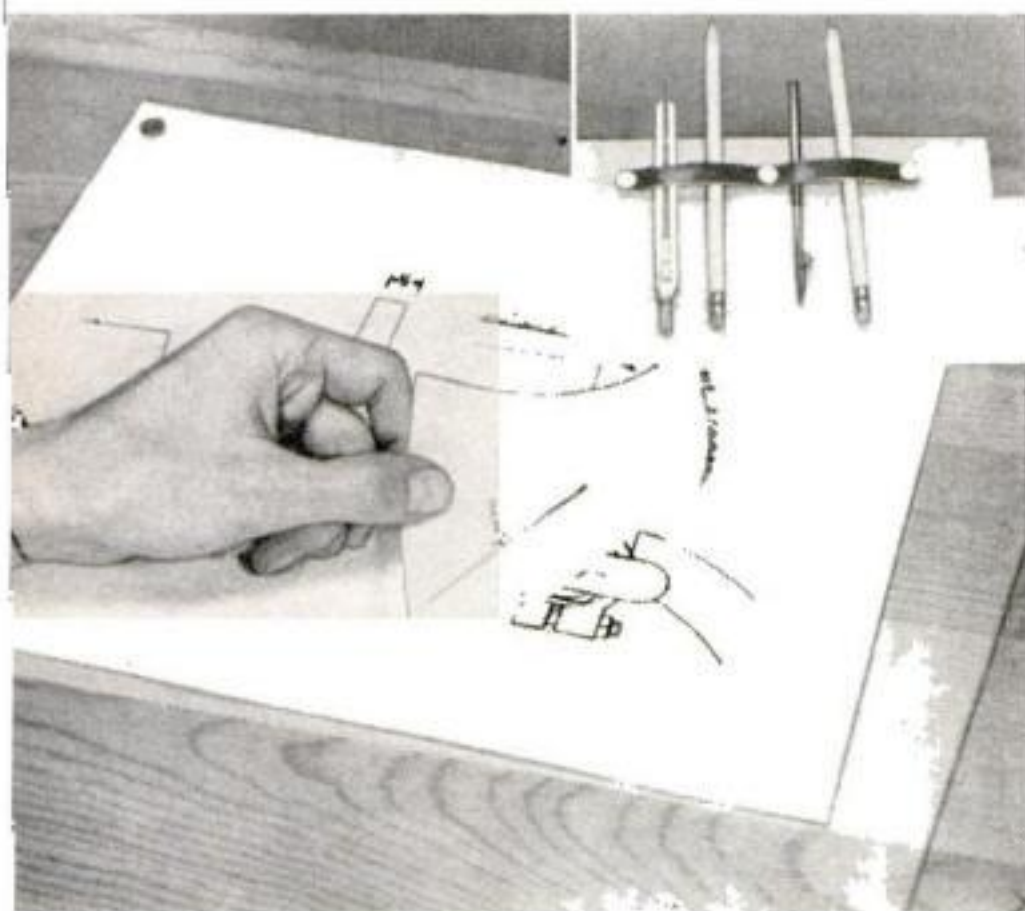
## —from Fellow Draftsmen



**Uniform guide lines** for lettering can be drawn two at a time by sanding or cutting flat sides on two pencils. Take away wood on each almost to the lead. Put cardboard spacers between them to suit required spacing, and tape the pencils together.—*M. W. Loftus, Chicago.*



**You won't smear inked lines** with a triangle if you apply household cement at each corner. This builds up projections that raise the triangle above the surface of the drawing. There's also less chance of smearing graphite on the drawing.—*M. W. Loftus, Chicago.*

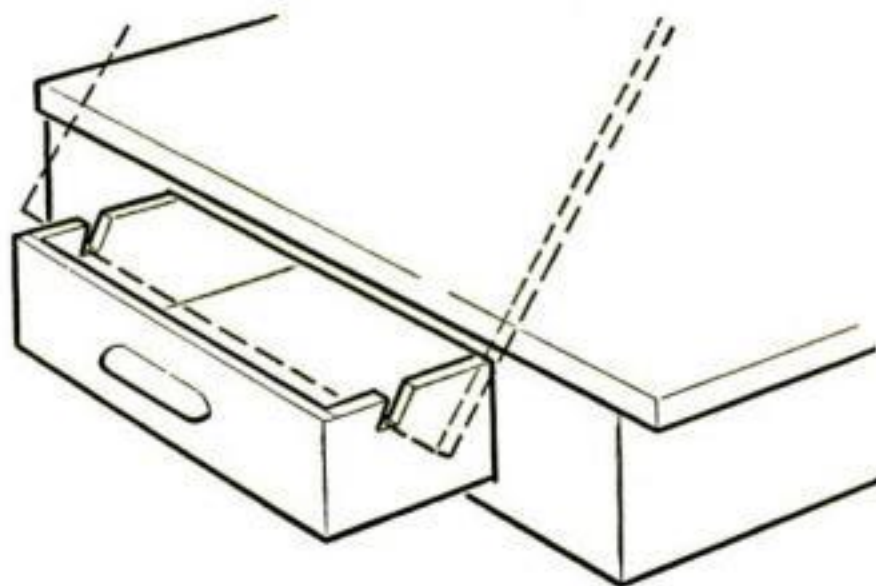


**Erasures can be reduced** on drawings if notations are first placed on an overlay of tracing paper. When the drawing and wording are finally approved, you can then letter the notations in place.

A strip of inner-tube rubber, thumb-tacked at the top of the drawing board (inset above), makes a handy holder for frequently used drafting equipment.—*R. Hanscom, Elmhurst, Ill.*



**Emery paper** glued in the groove of a draftsman's scale makes a handy pencil sharpener. A 2" strip is just right.—*Ken Patterson, Moose Jaw, Sask.*

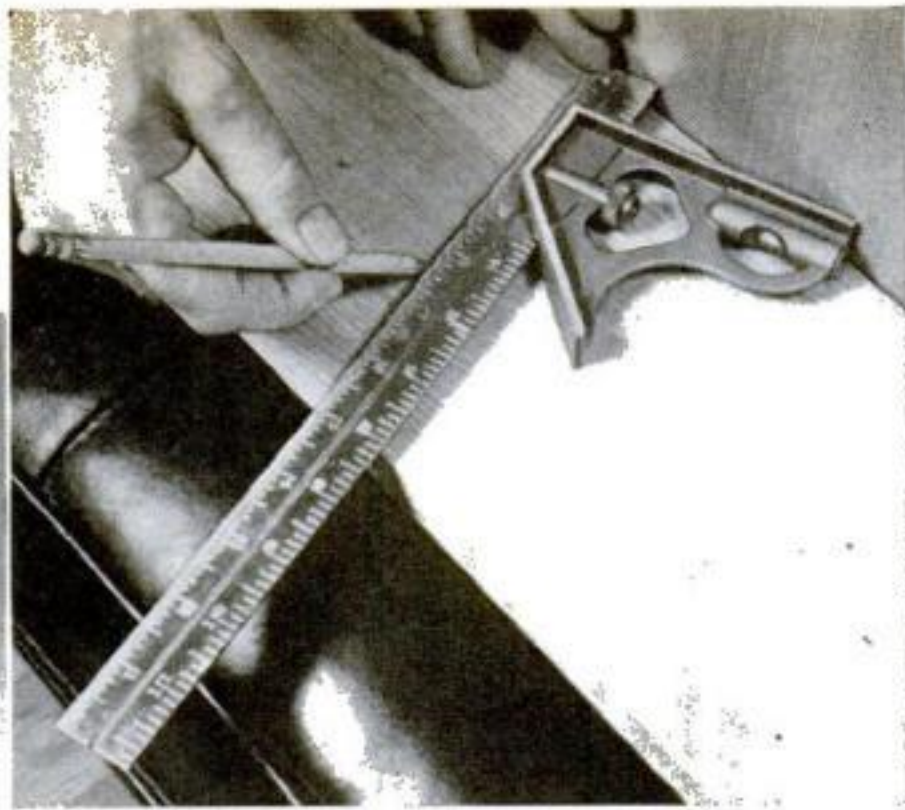
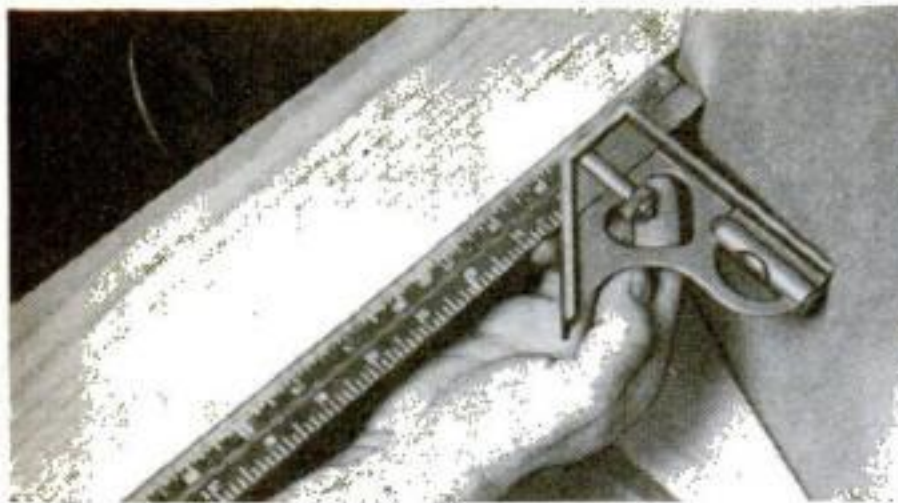


**A small drawing board** can be held at a convenient working angle by sawing slanting notches in a desk or table drawer.—*G. E. Hendrickson, Argyle, Wis.*



## Short Cuts and Tips

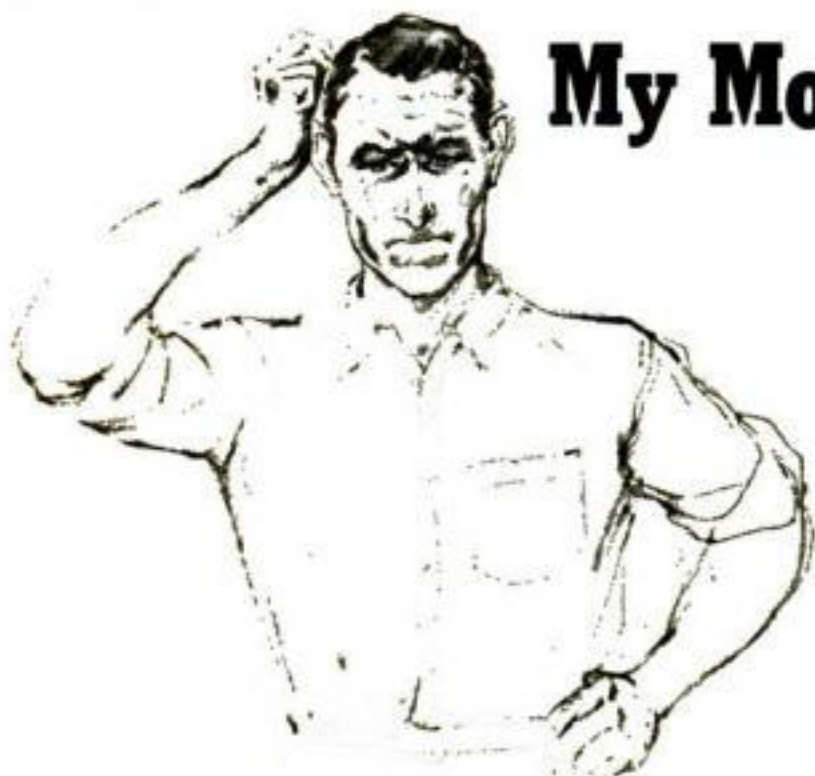
FROM PS READERS



### Transfer Acute Angles Quickly with a Combination Square

NEED to trim a board to fit an acute angle? Do it fast by holding the blade of a combination square against one side of the angle and sliding the body down until it touches the other side (above,

left). Lock the square and transfer the angle to the board by butting the square against a vertical surface at the board's edge (above, right).—*Darrell Huff, Pacific Grove, Calif.*



## My Most Embarrassing Shop Moment

**By Jerry Beebe**  
*Peru, Ind.*

WHEN my neighbor came over to borrow my saber saw, he looked disgustedly at the three-prong plug and said he couldn't use it because he had no grounded outlets in his shop. I handed him an adaptor plug—along with a stern lecture on the importance of grounding all tools.

I picked up my electric drill and pointed out that it too had a grounded plug, adding smugly that no one would ever be electrocuted in my shop. Then, still holding the drill in one hand, I reached up with the other to turn off the drop light hanging over my workbench.

The next thing I knew I was sitting on

the floor wondering who had set off the Fourth-of-July fireworks display inside my head. When I regained my senses and my neighbor saw I wasn't seriously hurt, he nearly collapsed with laughter.

This taught me a lesson about using brass sockets for drop lights. On a permanently wired socket, the hot lead is carefully connected to the center terminal and there is little chance of current leaking to the outer brass shell. But when the socket is on a plug-in cord, as mine was, there's a 50-50 chance that the hot lead will go to the threaded shell, depending on how you insert the plug in the outlet. If the cardboard insulation deteriorates, the outer brass shell on the socket may become hot.

This is what had happened to me. I hadn't noticed that the socket was live because I had never been grounded before when I touched it. This time, I was holding onto the metal-cased drill with a ground wire connected directly to the housing—and I became a path for 110 volts.

I immediately changed the socket for one with a Bakelite shell. As an added precaution, I installed a grounding-type plug on the cord and made sure that the neutral was connected to the nickel-plated screw in the socket, and the hot wire to the brass screw. I also grounded my bragging.



If he's  
particular,  
he doesn't just  
want tools...  
he wants

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**Model H131 1/4" Drill:** With geared chuck and key. Designed for comfort, balance, all-'round performance, easy maintenance. Perfect for drill attachments. Three-position, non-slip pistol grip. Regular \$24.95

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**Model H272 7" Builders Saw:** Heavy-duty construction. "Free Start" blade guard. "Motor Saver" drive, nearly 40% more cutting force at working speeds. Best builders saw for the money.

**SPECIAL VALUE  
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**Model H264 7/8 H.P. Router:** Heavy-duty, 23,000 rpm. "Spotlights" working area; brightness increases with work load. Recessed safety switch, and micrometer depth adjustment. Full ball-bearing. Regular \$69.95

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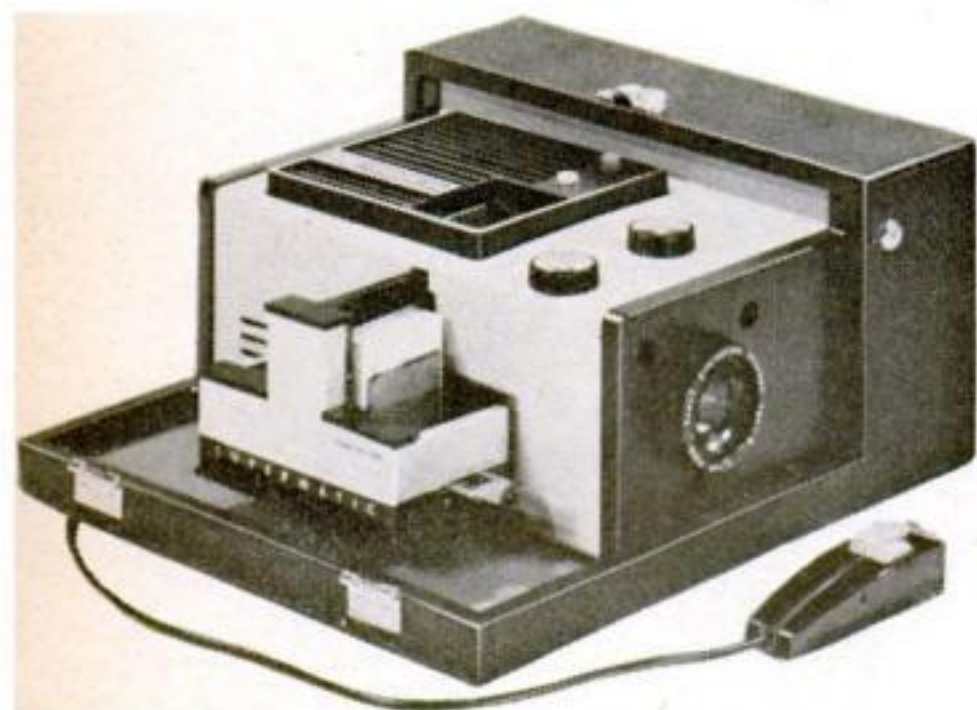
CANADIAN PLANTS: HAMILTON, ONTARIO AND ROXTON POND, P.Q.



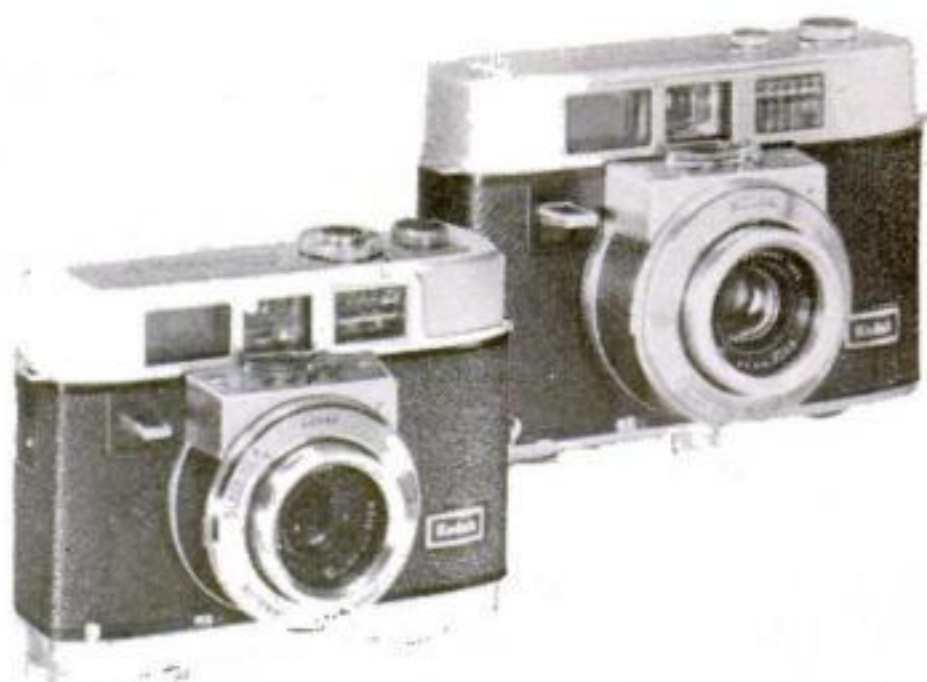


*Brownie Super 27 Outfit* includes camera, film, flashbulbs, batteries. Open it *first* to record all the thrills of Christmas. Camera has built-in flash, sure-grip shape,  $f/8$  lens. Complete outfit, less than \$19.

## Kodak gifts say ...and picture all your



*Kodak Supermatic 500 Projector* needs no trays. Lets you change slides and focus by remote control—while you relax with your guests. Less than \$95. See, too, Kodak's revolutionary new Carousel Projector. Circular tray on top holds 80 slides! Less than \$140.



*Sun or shade*, these two fine Kodak 35mm cameras adjust exposure automatically. Both have electric-eye lens setting for daylight shots . . . ingenious automatic flash control for indoor pictures. Both have fine, fast  $f/2.8$  lenses. *Kodak Motomatic 35 Camera*, left, winds film *automatically* after each shot! Less than \$110. *Kodak Automatic 35B*, right, is less than \$90.

Prices are subject to change without notice.

**EASTMAN KODAK COMPANY,**



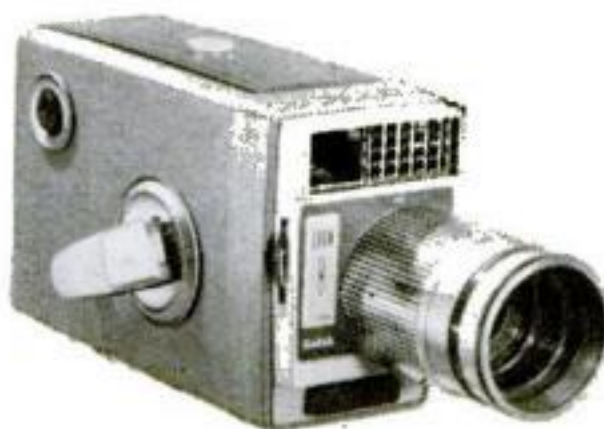


**Kodak Automatic 8 Movie Camera's** electric eye automatically sets lens opening. Just aim and shoot. Built-in filter. Less than \$50. Gift kit includes camera, light bar, lamps. Less than \$58.

# "Open me first" Christmas fun!



**Kodak Super Showtime 8 Projector (A25)** threads self, starts show automatically. 3-position lamp-saver control. Screenings up to 5 feet wide. Less than \$125. With zoom lens, less than \$140.



**Kodak Zoom 8 Automatic Camera.** You make exciting 8mm zoom movie shots by merely rotating the lens barrel. Viewfinder zooms, too! Has electric eye, focusing  $f/1.6$  lens. Less than \$110.

See your dealer—for both cameras and film. Many dealers offer terms as low as 10% down.



**Brownie Starmite Camera** is a handsome little handful! Always in focus. Built-in flash holder uses thrifty AG-1 "jellybean-size" bulbs. Makes clear pictures in color and black-and-white, indoors or out! Famous Kodak quality . . . less than \$12.

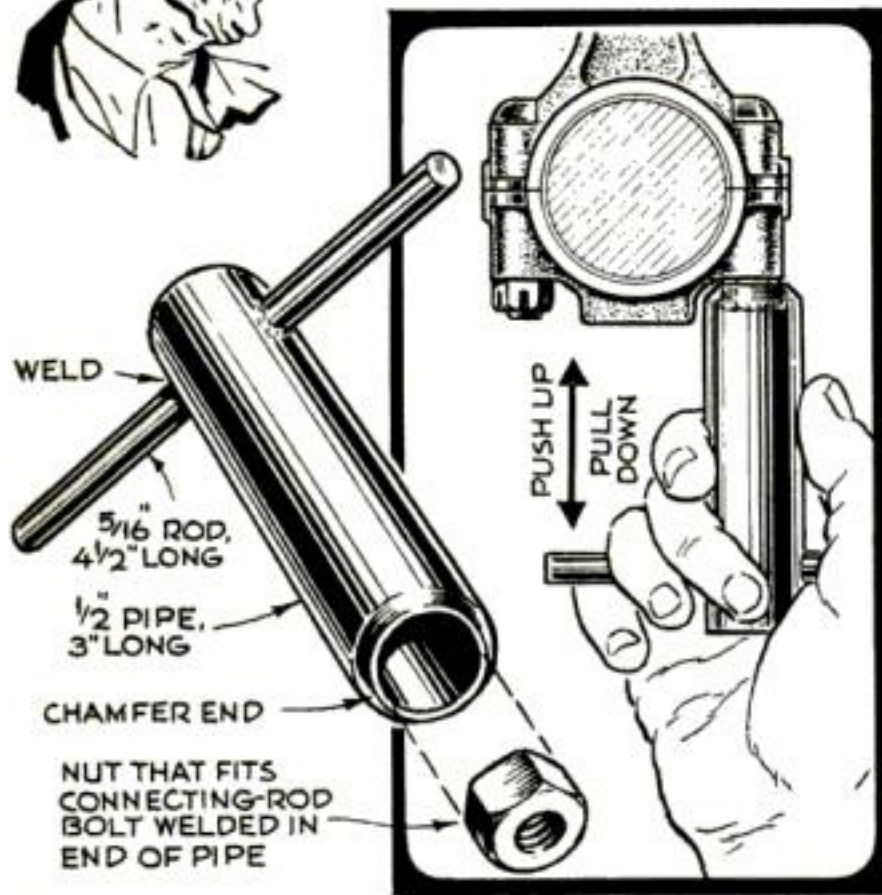
**Kodak**  
TRADEMARK

Rochester 4, N. Y. ENJOY WALT DISNEY'S "WONDERFUL WORLD OF COLOR" SUNDAY EVENINGS, NBC-TV.

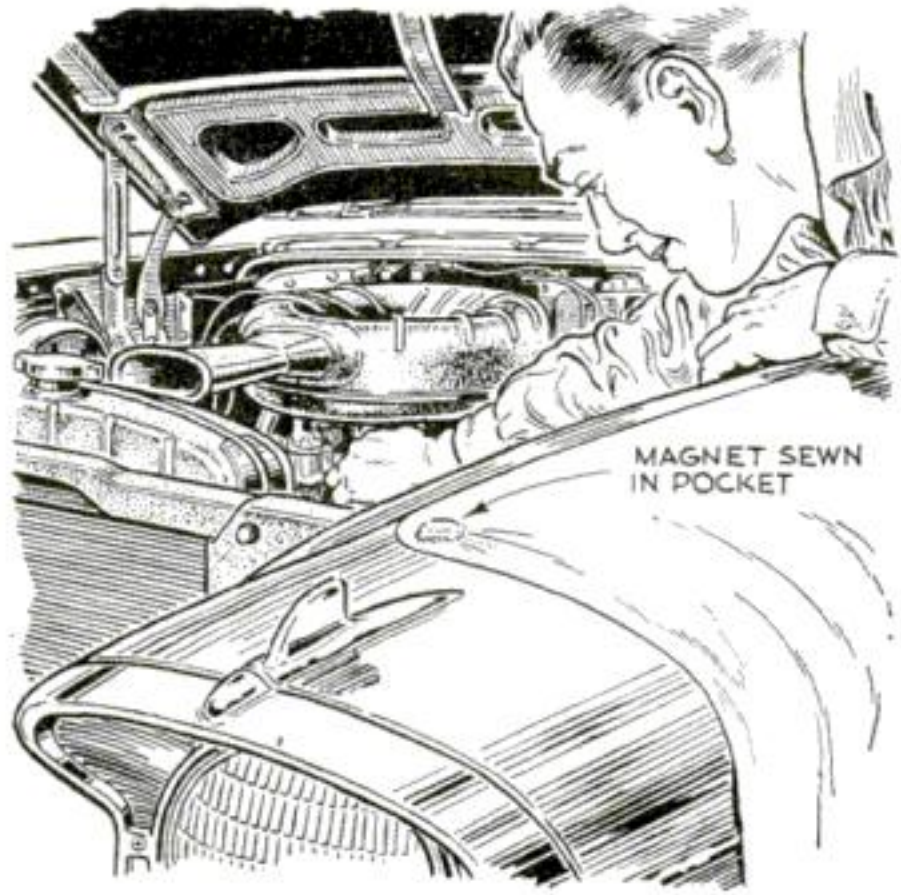




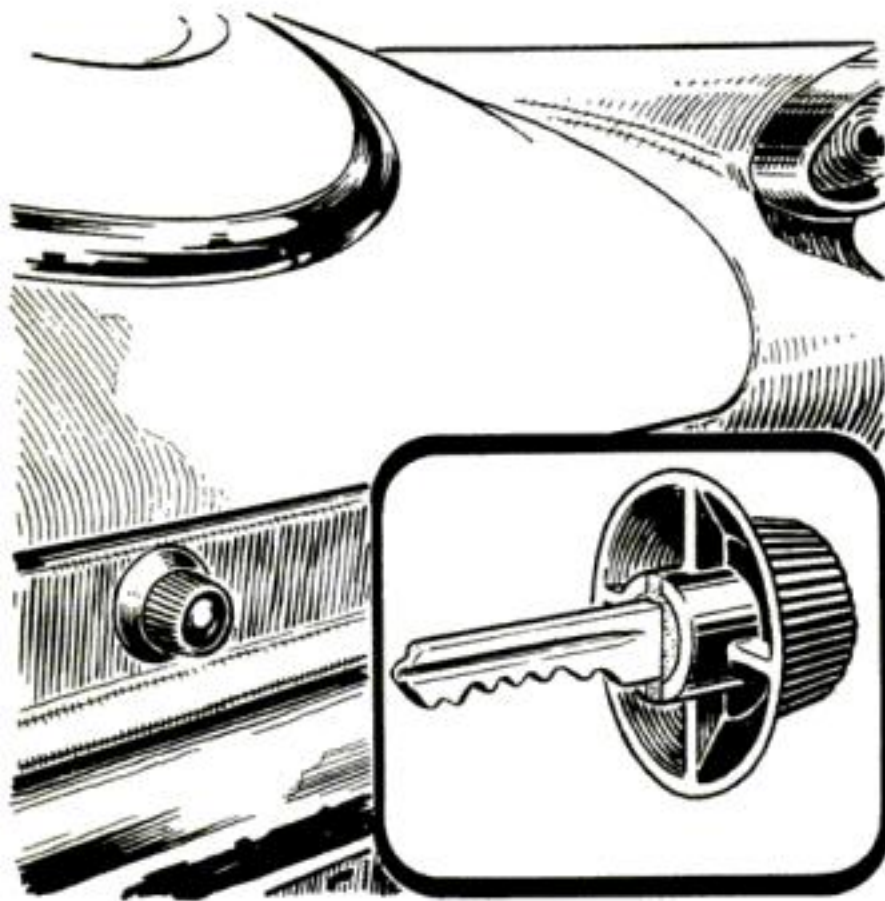
## Hints from the Model Garage



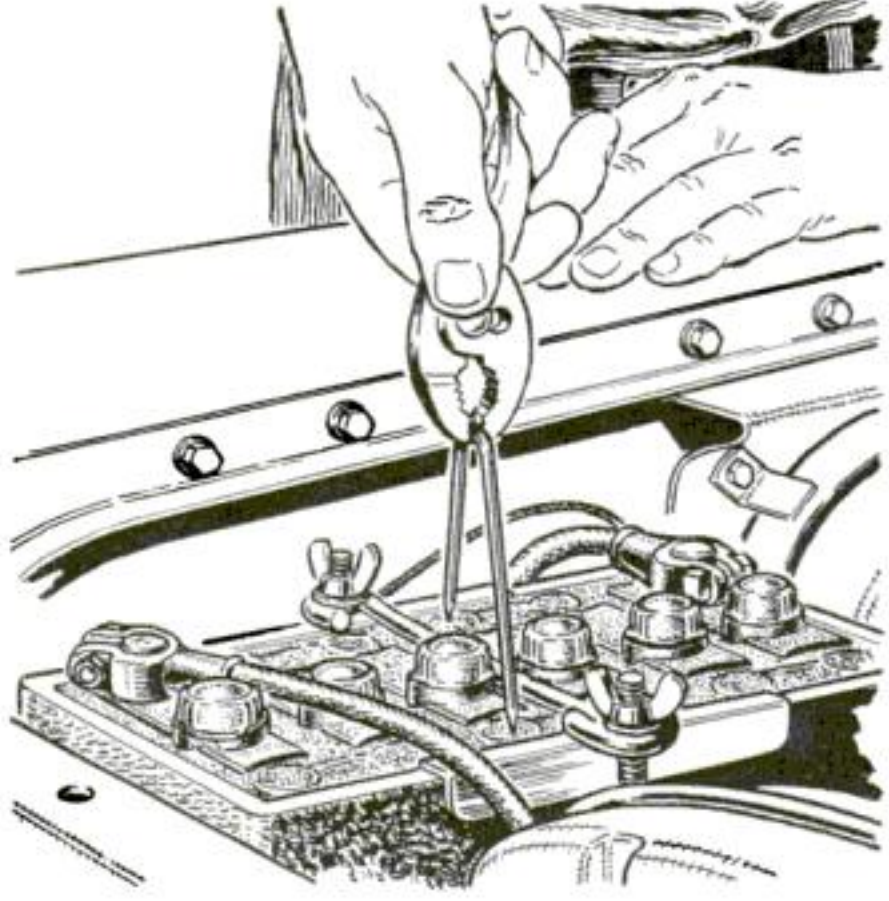
**To check the big-end bearing** of a connecting rod for looseness, remove one cap nut, and screw this homemade tool on the stud. The T handle affords a good grip that permits you to push the bearing up and down to detect play.



**A fender cover won't slip** or blow away if you sew a permanent magnet in each upper corner. Fold the corners of the cloth over the magnets, or sew a patch over them, to hold them in place and prevent them from scratching the car finish.



**If you open the trunk frequently**, you might find it more convenient to leave the key in the lock. The key can be concealed by filing its head and cementing it into a TV or stove knob. Paint the knob to match the finish of the car.



**Try bridging a dead cell** with the pointed ends of a heavy wire, as shown above, next time the battery won't crank the engine. Bridging the dead or open cell will often cause enough current to flow from the good cells to turn over the starter.



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"GO"  
PER  
GALLON**



**Standard on every *OLDS* Dynamic 88!**

**New 280-h.p. Rocket Engine with Fire-Swirl Combustion . . . new low-ratio rear axle . . . give the '62 Dynamic 88 extra sass with savings to match!**

**There's rocketing new high-compression performance in the Oldsmobile Dynamic 88 for '62!**

**With 30 more horsepower than its previous counterpart, the '62 Rocket V-8 features a 10.25-to-1 compression ratio and a unique Fire-Swirl combustion chamber that improves both fuel-air blending and firing efficiency.**

**The chamber is shaped much like a partly flattened ball, with a concave piston head forming the lower half. The valve opening is positioned to swirl the fuel mixture in the cylinder; and as the mixture orbits before ignition, the gas is thoroughly vaporized. The swirling continues after ignition, spreading the flame uniformly and effecting more complete combustion.**

**And the ultra high-compression Rocket is teamed with a new 2.56-to-1 rear axle ratio that gives it *economy*, along with its *responsiveness*! Each dollar's worth of gas buys as much actual mileage as previous Dynamic 88 owners**



**Unique Fire-Swirl combustion chamber provides better fuel-air mixing and improved firing to squeeze top performance out of every gallon of gas!**

**enjoyed . . . with a tremendous new reserve of power as a bonus!**

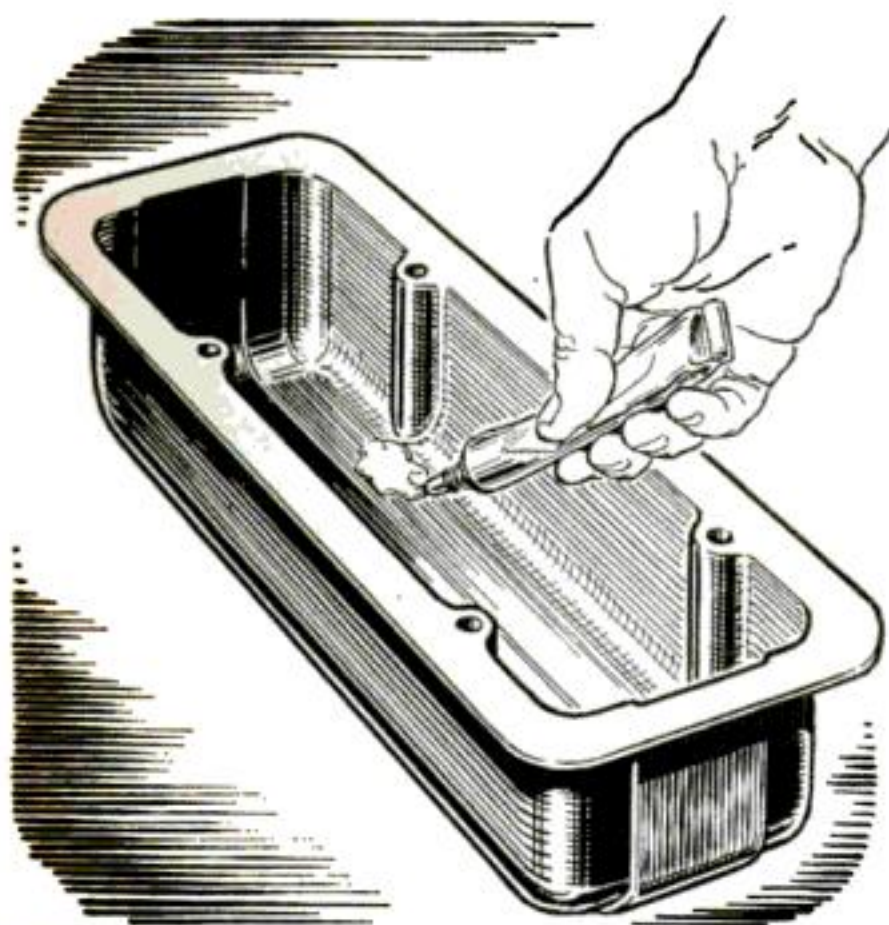
**The real proof of Oldsmobile's new engine advancements is, of course, on the road. One mile in a Dynamic 88 should convince you that Olds engineers have hit the right combination of performance and economy. Take a test run today in the car that delivers more "go" per gallon—the dazzling, dollar-saving new Olds Dynamic 88!**

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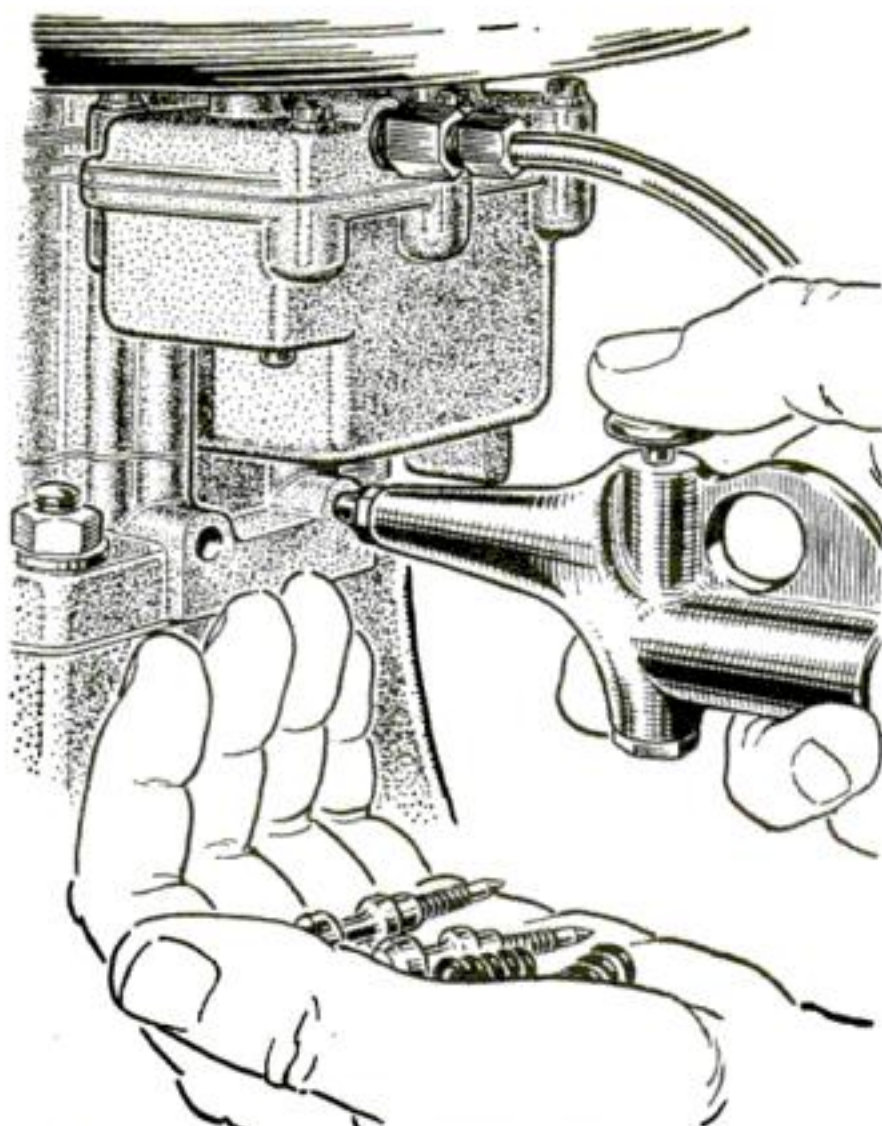
***There's "SOMETHING EXTRA" about owning an OLDS!***



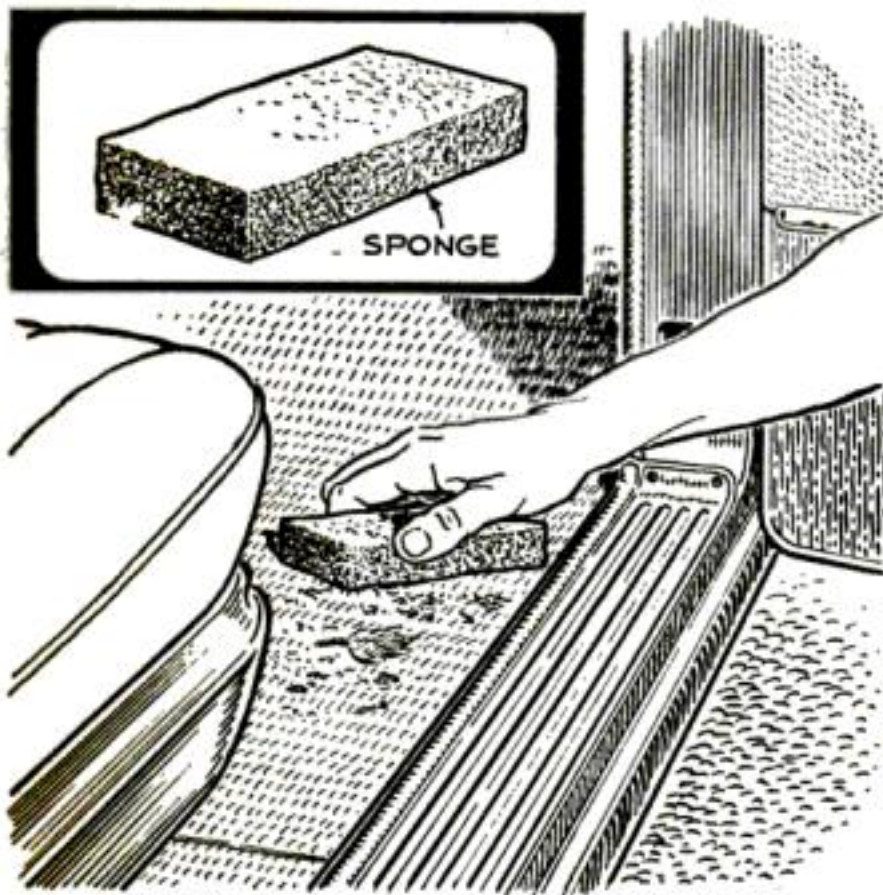
## More Hints from the Model Garage



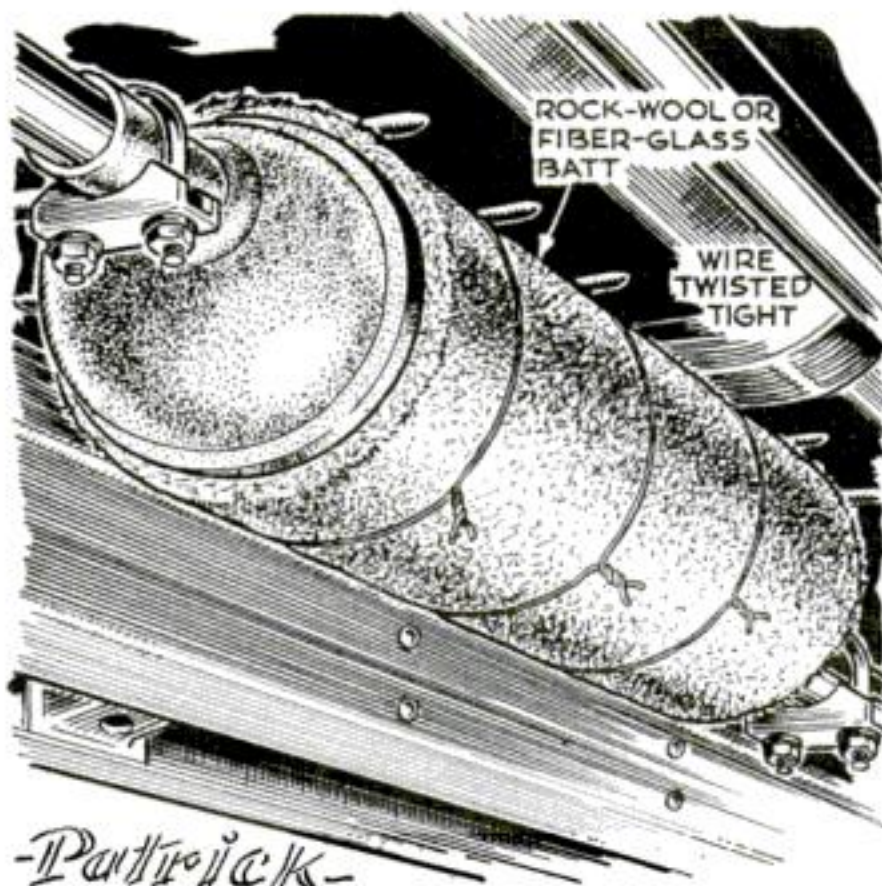
**Overhead valve noise** can be quieted by coating the inside of the rocker-arm covers with a pliable-setting gasket compound. This type of material is unaffected by the hot detergent oils that wash out other sound-deadening coatings.



**Got a rough-idling engine?** If it can't be cured by adjusting the mixture, the trouble might be caused by dirt lodged in the idling system. Remove the adjusting screws and try blowing compressed air into the openings to clear them.



**Use a damp sponge** instead of a whisk broom for cleaning the floor mats in your car. The sponge picks up both dirt and small pebbles without raising dust, and it freshens the color of the mats, whether they are rubber or carpeting.



**For less condensation** and longer life for your muffler, wrap it with a fiber-glass or rock-wool batt to keep it from cooling too quickly. The insulation will also keep the interior of the car cooler by shielding the floor boards.



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one of these quality...*

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Make the most of your skill—with tools of Disston quality. Designed for easier handling, built to last. They have an edge on all others. Ask her for Tools by DISSTON—Master Toolmaker since 1840.

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Special Retail Price: **\$49.50**

Most powerful 6½" saw you can buy. Fast, effortless cutting—rated at 10 amps. Has 1½ hp motor. Diss-chrome blade makes 2¾" cut at 90°; 1¾" cut at 45°. Has "Life Saver" detachable plug.

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Finest hardened and tempered steel blade. Handle of cover-top hardwood, fully carved, weather-proofed. 26" long,—rip or crosscut points.

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Special Retail Price: **\$49.50**

Cuts straight, circles and bevels in wood, metal

and plastic. Handsaw-type handle, "Life Saver" detachable lock-in plug; "Orbite" blade action prevents drag and back-cut. 2.75 amps, 3600 strokes per minute. Depth of cut: 3".

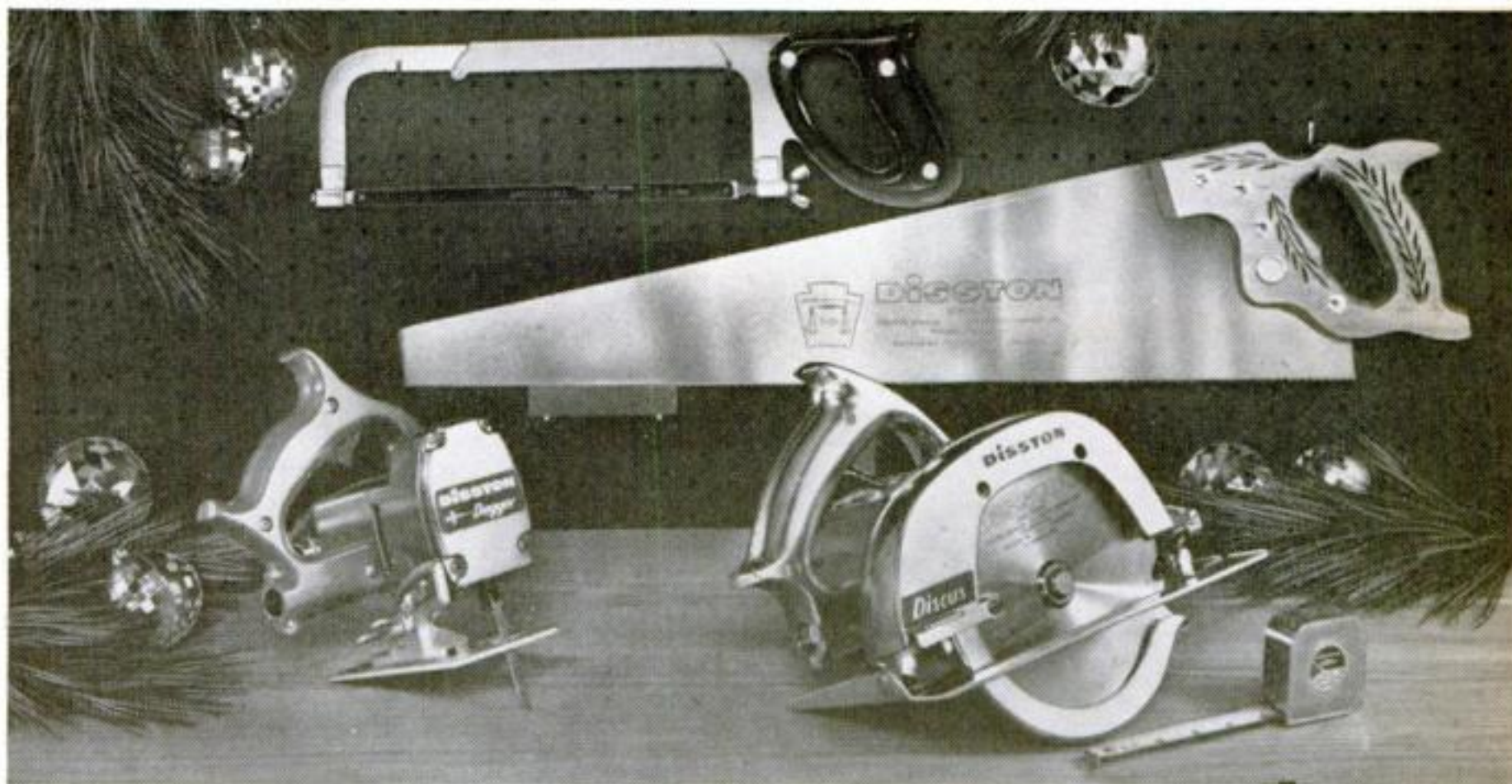
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16' long, stays rigid over entire length. Swing-tip end hook flips for easy, accurate inside and butt measurements. Graduated in 16ths, black on white. ¾" wide.

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Sturdy, nickel-plated steel frame with steel handle faced with black plastic. Adjustable for 8, 10, 12-inch blades. 4 cutting positions.

*Available at leading hardware and department stores everywhere*



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(CLIP THIS AD—LEAVE IT WHERE SHE'LL FIND IT!)

(CLIP THIS AD—LEAVE IT WHERE SHE'LL FIND IT!)



# Gus Plays a Diplomatic





# Role

By Martin Bunn

LATE on a frosty Christmas Eve, the proprietor of the Model Garage ran his car up the ramp to the shop door. His lights sparkled on snow banks and glowed on the big door as he got out to open it.

Sleepy, after dinner with out-of-town friends, Gus wanted only to put the car inside and get to bed two blocks away. But as he turned on the garage lights, the Model Garage sign lit up, too.

He drove his car in and sauntered to the door, stretching. As he reached for the light switch, the sound of an engine came through the snow-hushed night, its beat so odd that Gus paused and listened. The sound grew louder and he looked out to behold a curious cavalcade.

In the lead was a small imported car. Pushing it was an American luxury sedan about six years old. An arm waved wildly from the little car's window, and the horn buzzed frantically. The car swung in and stopped near the pumps. The big car stood behind it, its engine idling roughly.

"Are you open?" inquired an anxious feminine voice. "We're in a jam."

Gus walked to the small car. "Shop's closed. What's wrong?"

A woman's face, framed in a fur collar, a cloche hat, and stray wisps of red hair, peered out. "That big car skidded—not their fault really, something's wrong with it, too. But it made me hit a snow pile. My engine stalled and wouldn't start again, even when they pushed me in high gear. It's cold—and I've got a baby."

Gus could see a car cradle in back, a tiny red face screwed up in sleep. "Better get you inside," he said, and walked back to the big sedan. Its uniformed driver stared woodenly ahead, shoulders jerking with the rocking of the car.

A soft voice spoke at Gus's side: "He knows no English. Allow me."

For an instant Gus wondered if he were dreaming. By the pump island stood three bearded, turbaned men who must have alighted from the big car. The shortest, who had addressed Gus, spoke to the chauffeur in a strange tongue. Gently the big car nudged the little one into the Model Garage and backed out again. Gus noticed that it had diplomatic plates.


"We are members of a delegation to the United Nations," explained the turbaned stranger. "We are on our way to attend a reception at our embassy tomorrow. But an hour back, the car developed an impairment. Now it has disabled that of this lady. We are unable to help her or ourselves. Can you assist us?"

"I'll try," said Gus. "When did your car first act this way?"

Teeth glowed whitely in the black beard. "Pray speed the lady on her way first. Her plight is worse than ours—and of our making."

One of the other men was visibly shivering with the cold.

"I'll take care of her," promised Gus. "But as you're on official business, I'll check your car first if you like."



Gus reached for the key and the man reacted as if stung. Thin fingers locked talonlike around Gus's wrist.

CONTINUED

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"Thank you, no. It is to help her that we left the main road. Our car can travel, though it shakes so that we like best not to wait in it, as you see."

"Okay," said Gus. "Come on inside."

**H**ASTILY Gus donned coveralls, and with three pairs of dark eyes on him, lifted the deck of the little rear-engine car.

A quick check showed Gus that the spark was good and gas not only reaching the carburetor, but flooding it. He removed, cleaned and regapped the gas-fouled plugs. Then he detached the air-filter assembly from an intake pipe.

The automatic choke was closed. Gus held it open while the young woman tried the starter. After a pop or two the engine caught, ran rough briefly, and settled to a fast idle. Gus put an exhaust hose on the tailpipe to let it warm up. The choke opened in due course, and the engine responded to the throttle with no more flooding.

Had the shock of ramming the snow jammed the carburetor float valve? If so, it was working now. Gus shut off the en-

gine. The young woman came up while he replaced the air filter and took off the exhaust hose.

"I'm so glad you fixed it," she said. "We're on our way to the air base. My husband's a reserve officer there—he couldn't get leave. He'd be awfully worried if we were delayed longer."

"Drive down the block and back," suggested Gus, "to let me know it's okay. Otherwise I'll come after you." He shook his head as she opened a pocketbook.

"No charge to service people on Christmas."

She smiled gratefully, got in, and started the engine. As if on cue the turbaned strangers rose and bowed. But the little car moved hardly a foot before the engine gasped and died. The baby in the back of the car began to wail.

Its mother was out of the car in a flash. She cradled the child in her arms, blowing wisps of hair away from her eyes. Gus flung up the engine deck. He found the carburetor flooded, and again removed the air filter. But the choke was open.

"Have any trouble before you hit that snow?" he asked the young woman.

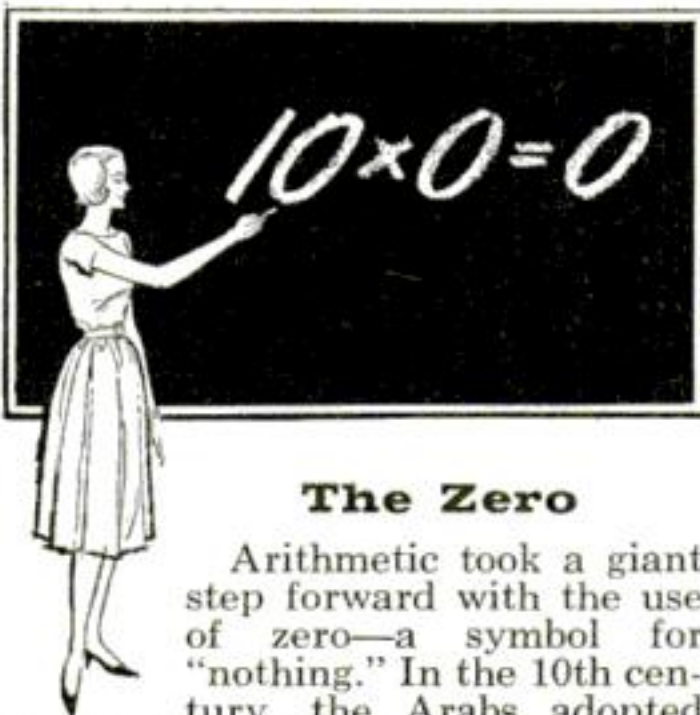
She shook her head. Gus cranked the engine. It fired after a few turns, and took gas nicely. He set on the air filter, again gunned the throttle. The engine died.

Sliding under the car, Gus traced the air-filter pipe forward, along the chassis, to an air scoop in front. He wasn't surprised to find this so clogged with snow that it could pass just enough air for idling. Given gas to run faster, the engine strangled itself.

Removing the packed snow took only a minute. Gus explained to the officer's wife what to do if she plowed into any more. She resettled the baby and, after another bow from the three strangers, drove off, headed out of town.

**W**ITH immense dignity the slim, olive-skinned chauffeur drove the big sedan into the shop. He sat in the seat rocking while Gus checked for missing by shorting two plugs at a time. Despite the vi-

### Where'd it come from?



### The Zero

Arithmetic took a giant step forward with the use of zero—a symbol for "nothing." In the 10th century, the Arabs adopted the Indian system of numeration—1, 2, . . . 9. With it, they took over the Indian word "sunya"—empty—which they translated as "sifr."

Before this time, the most popular way of counting was with an abacus. Now to write down a counting-board number using the new method, you had to have some way of recording the empty columns on the board. Thus :: might be 32, 302, 3,020, etc. To avoid confusion, the "sifr" was used.

The word passed into Italian in the 13th century as "zephirum," finally shortened to zero. Meanwhile, "sifr" became "cipha" in German and later the English cipher. The symbol was also used as a secret sign—hence, decipher.



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bration, the V-8 engine was hitting on all cylinders.

"Shut it off now!" cried Gus.

The driver ignored him. Gus reached in for the key, and the man reacted as if stung. Thin fingers locked like talons around Gus's wrist.

"Please excuse," murmured the turbaned spokesman. "Once stopped, the engine will not start again."

"Just how did this trouble begin?"

"An hour ago, as we rode, there was a loud noise as of a blow. The machine began to shake. Twice we stopped at petrol depots. When our driver stopped the engine, it was necessary to push with another car to start it. The attendants said

near the hub, leaving an unbalanced fan to rock the engine at every turn. But why should that make starting impossible?

Gus traced the hot battery cable, then the ground strap. This ran from the engine block to a clip on the battery cradle far up front, then to the battery post. Light glinted on newly cut metal.

Where the strap lay against the battery, all but a few strands were severed. The few that remained couldn't carry the heavy starting current. Embedded in the battery case was the fourth fan blade.

Gus wriggled it free. Slowed by cutting the ground strap, it hadn't penetrated enough to cause leakage.

"I haven't got a new fan," said Gus.

"Best I can do is cut off the odd blade to leave the other two balanced."

Removing the blade assembly, Gus sawed off the blade opposite the broken stub, hung the fan on a sharp edge, and filed the stubs until it was in balance. He installed a new ground strap, melted pitch from an old battery into the gash left by the flying blade.

When he tried the starter, the engine fired up and idled like a Rolls.

"Providence was gracious to bring us to your door," intoned the spokesman.

The chauffeur leaped into his seat and deftly turned

the car. Ceremoniously the three men bowed. One thrust an envelope into Gus's hands as they got into the car.

As the tail lights vanished, Gus peered into the envelope. It held a bill worth 10 times what he would have charged.

"Caught with the goods," called a dark figure nearby. "How come you're open on a Sunday—and a Holy Day, at that?"

"Officer Mulrooney, is it?" asked Gus. "And what would you do if travelers in distress hammered on your door?"

"Just what you've done," answered Mulrooney. "But what brought those three whiskered guys here on Christmas Eve?"

"Kindness," said Gus. "Consideration for somebody else. Good reasons for all of us to act on. Maybe if we did, it might be Christmas all year long." ■ ■



"Er . . . Yes, ma'am, this is the drive-in bank."

that it is probably a broken val—val—"

"Valve or valve stem?" supplied Gus.

"Yes, thank you. Because of the holiday, they could not repair it."

"Nor can I, if that's it," said Gus. "Now please shut off the engine."

After an exchange of liquid syllables, the chauffeur reluctantly turned the key. Gus examined the engine mounts. None was broken or loose. The spark plug leads were properly spaced—no chance of cross firing by induction. Besides, there had been a noise . . .

What besides a broken valve could, in a split second, make a smooth-running engine begin to vibrate? A fan blade bent by a flying rock? Gus's light showed three good blades. He pulled the fan around to see the fourth. There was no fourth.

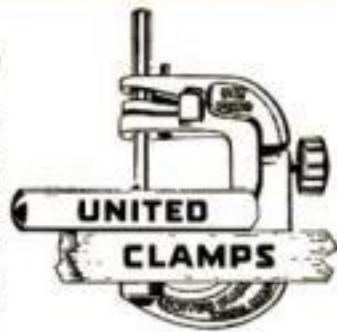
The missing blade had snapped off



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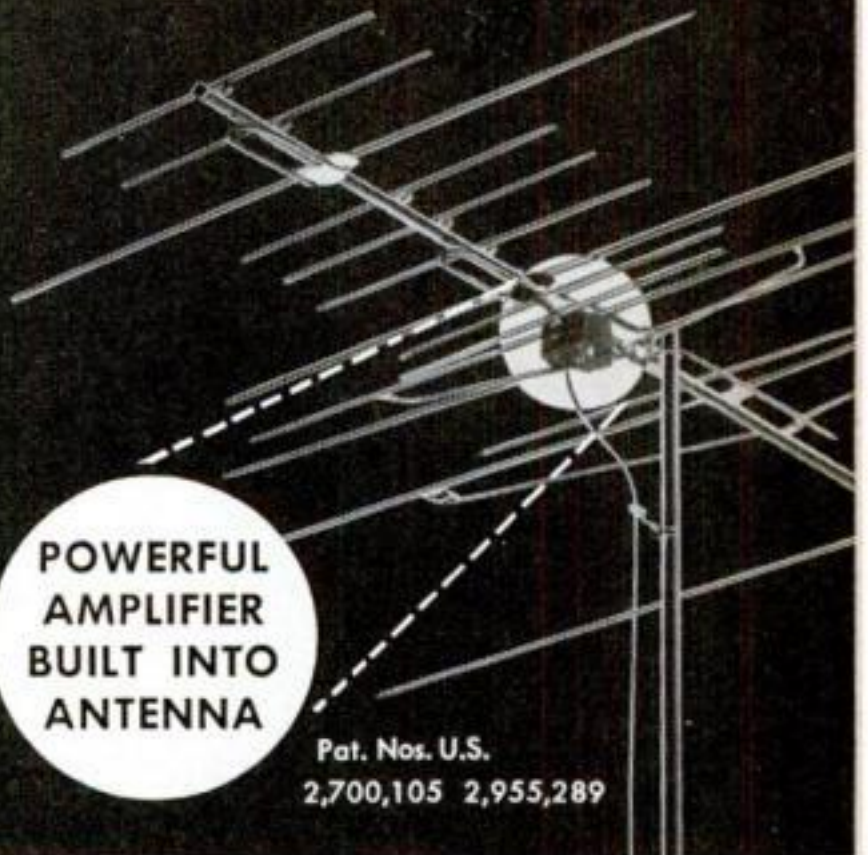
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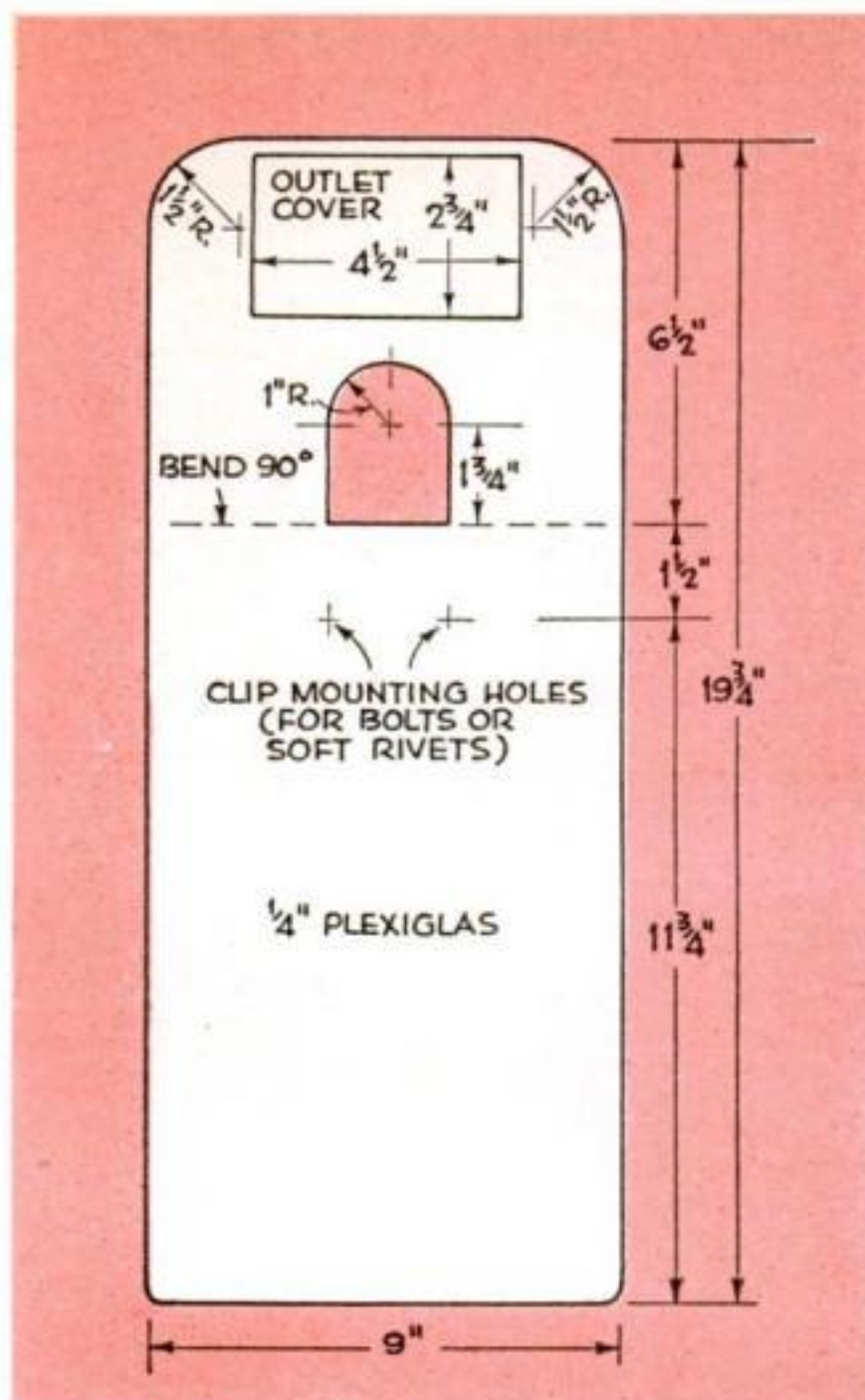
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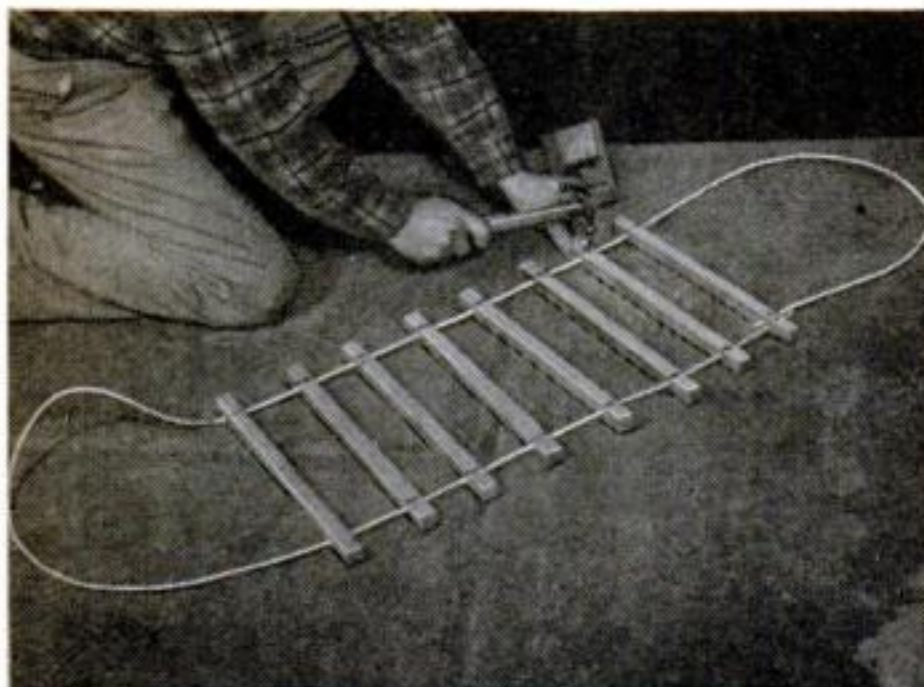
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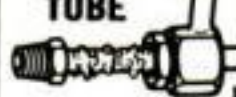
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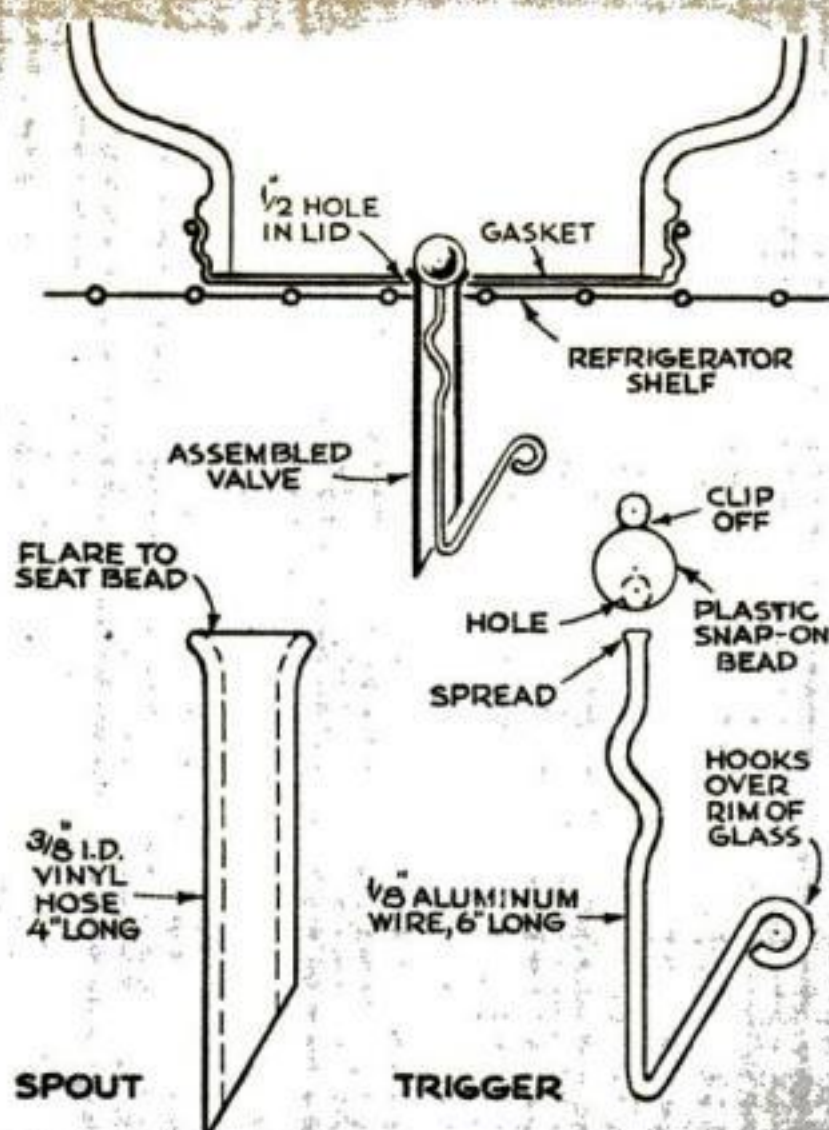
## Short Cuts and Tips

FROM PS READERS



### Water Cooler for Refrigerator

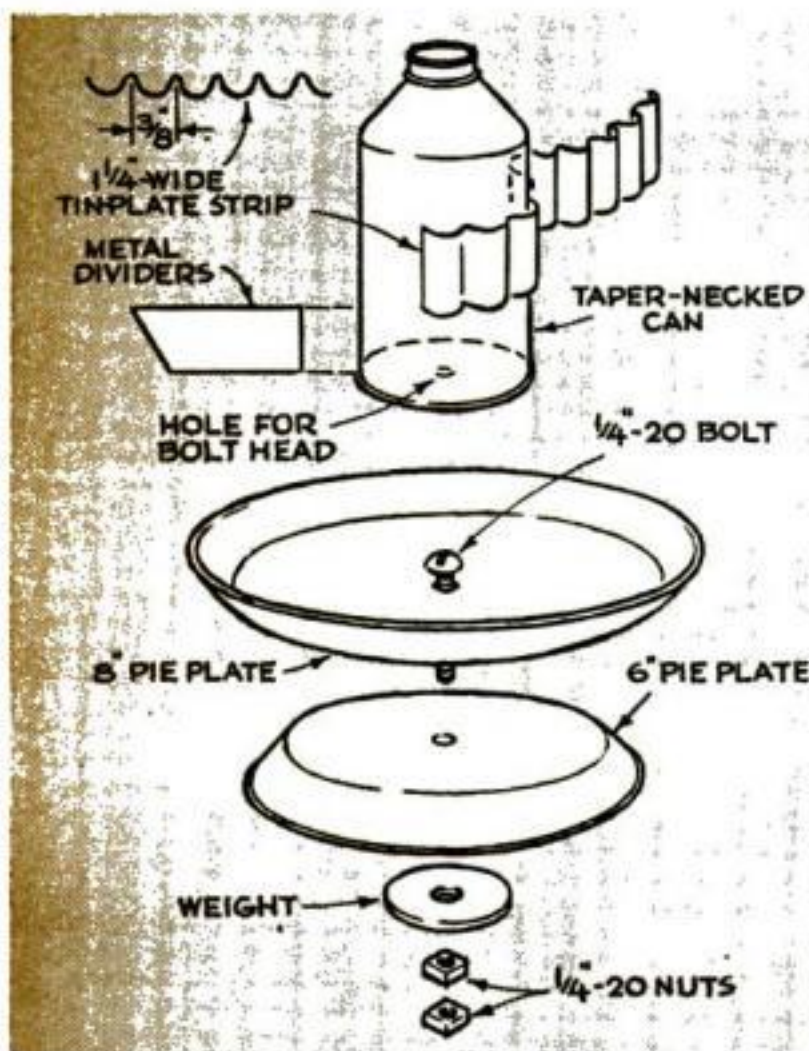
A READY supply of cold drinking water is yours when you make this simple dispenser. Puncture the lid of a wide-mouth gallon jar. The lid should have at least a paper liner; a gasket of rubber or soft vinyl will be more durable. Soften one end of the spout hose by holding it over



an electric burner, and create the flare by pressing against a ball-peen hammer. Flatten one end of the trigger wire until it wedges tightly in the hole of the jewelry bead. Shape the S curve so the trigger will ride straight in the spout. In making the sharp bottom bend, allow for at least  $\frac{3}{4}$ " vertical movement.—Charles Metcalf, Ft. Lauderdale, Fla.

### Lazy-Susan Pencil Holder

A CADDY for a drawing board is handier if it revolves to permit quick selection of pencils, brushes, erasers, thumb tacks, and other supplies. Bolt the bottoms of two pie plates together; don't place washers between them—just a little grease or graphite. Draw up the first nut to a turning fit and lock it with the second. Center a beverage can on the top plate, and solder three or four partitions between the can and the rim. Crimp a tinplate strip around a  $\frac{1}{4}$ " rod to form corrugations, and tack-solder this around the can.—Harry Walton, White Plains, N.Y.





# Coast to Coast with the PS Kinderwagon



**San Antonio youngsters** try out a PS Kinderwagon built by Maxwell Higginbotham from plans in the June and July 1960 issues. Higginbotham had trouble with belt slippage when two grown-ups commandeered the car, but corrected this with adjustments and belt dressing. A rear-view mirror is on toe-board. Full-size plans for the Kinderwagon are still available for \$2 from Gil-liom Power Tools, 1109 N. 2nd St., St. Charles, Mo.

**Headlight and bumper** are extras added by Fred Kuklinski of Southfield, Mich., for his son, Fred Jr. Bumper is two lengths of chrome shower-curtain tube. Steering wheel is cut down Model T. The power plant: a 2½-hp. Clinton. From Frostburgh, Md., another builder, Timothy Fuller, reports: "Performance is so good the kids have me about nuts arguing over whose turn it is to ride it. I sure am the most popular guy on the block."

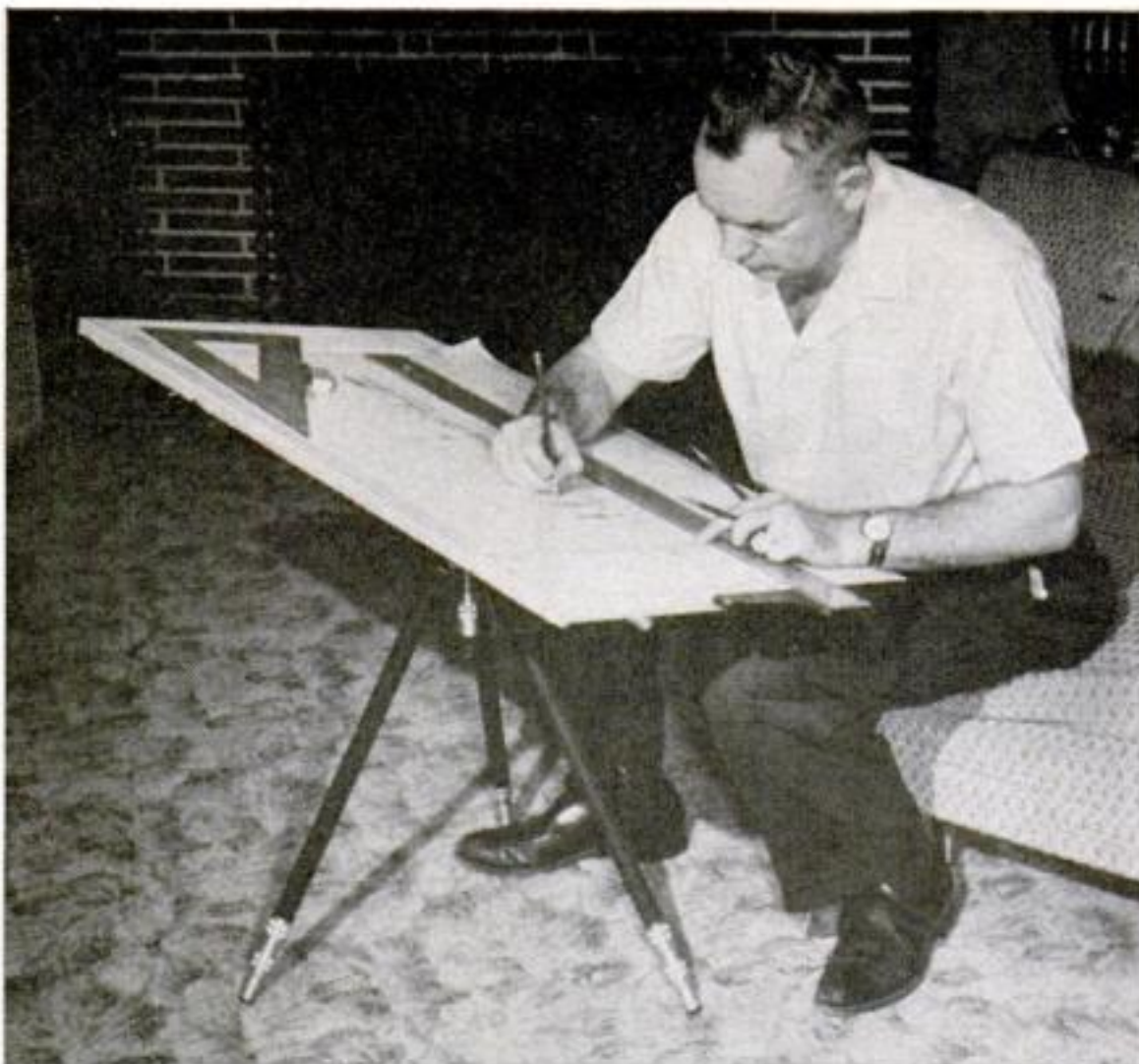


**"Racing" version** sports heavily treaded pneumatic tires for good traction. Its builder, B. H. Preston of Salem, Va., also added a pedal-operated throttle and padded armrests. Still another builder, Bud Hayles of Fort Madison, Iowa, was amazed at the design's reliability: "I assembled the whole car without even trying the engine or drive. The little rascal took off perfectly on the first try."



## Short Cuts and Tips

FROM PS READERS



### Tripod Drafting Board Becomes an Artist's Easel

FOR work at home or on the building site, architect Vernon Swanson made a drawing table from a camera tripod and a piece of  $\frac{3}{4}$ " plywood. On the underside of the plywood, he screwed a  $\frac{1}{4}$ " aluminum plate with a  $\frac{1}{4}$ -20 threaded

hole tapped in it to take the tripod screw. The tilting pan head and telescope legs permit him to adjust the board to any angle and height. The board also makes a good portable easel for a weekend artist. —Edward R. Lucas, Poulsbo, Wash.



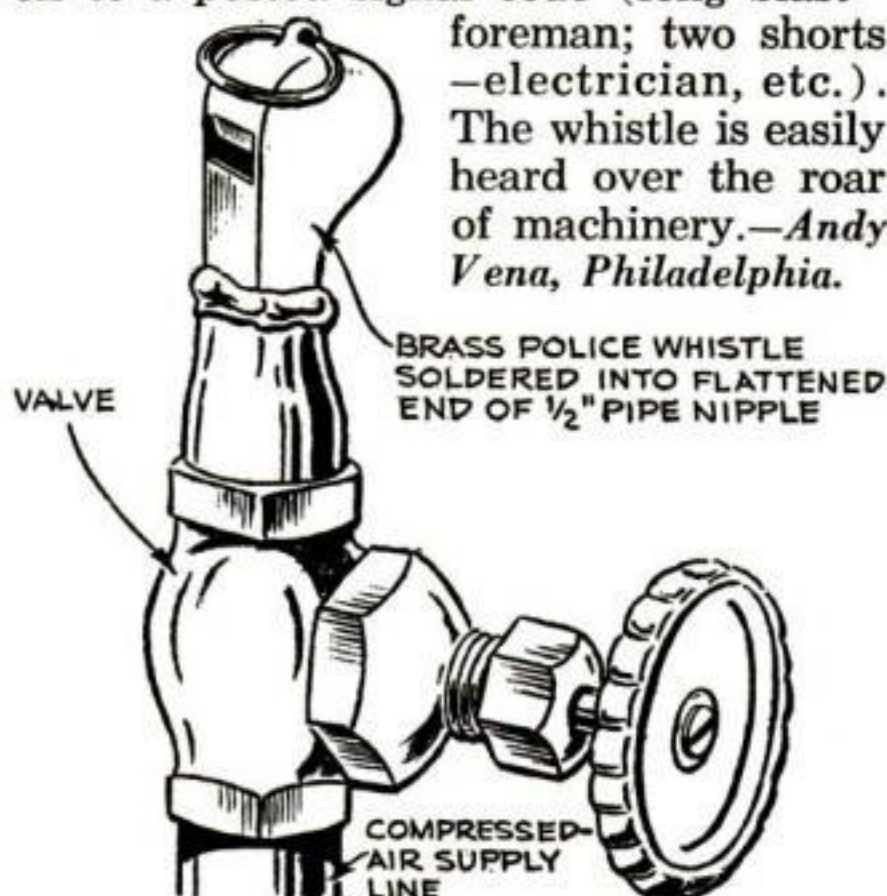
### Leather Pants for a Lighter

LOSE your lighter from your shirt pocket each time you bend over? It'll be less slippery if you cover the lower half of the case with suede or other soft leather. Use a flexible wood glue, such as polyvinyl resin, to bond it to the metal. —Bob Gilmore, Sonoma, Calif.

### Compressed Air Blows Whistle

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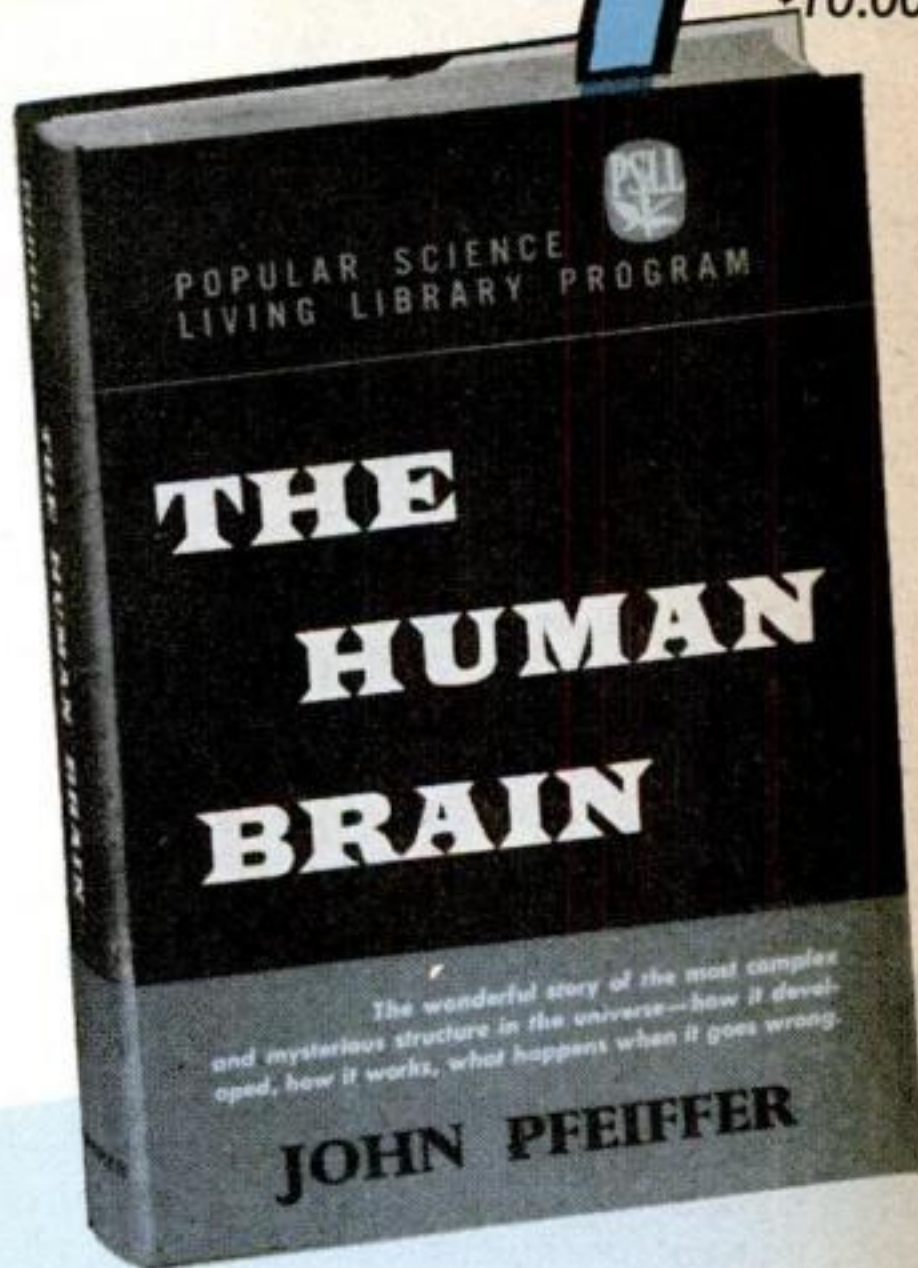
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Aluminum companies that Fuller approached during the 1920s with his advanced ideas were openly scornful. "They told me aluminum was used for making dishpans and souvenirs, not buildings," the soft-spoken inventor recalls. But in spite of disappointment, Fuller continued to come up with precedent-shattering ideas.

Among the Jules Verne-like items his active brain poured out over the next two decades were:

- A three-wheeled rear-engine automobile that can travel 120 m.p.h., get 40-50 m.p.g., turn in its own length, and slither with ease into the tightest parking places.

- A practical vertical-takeoff jet-powered airplane—designed in 1927.

- A complete one-piece die-stamped bathroom that can be installed in minutes, complete with a "fog gun" that shoots out a stream of 90 percent air and 10 percent water (no soap needed) for more efficient bathing.

- A new kind of map, based on his math, that eliminates the distortion inherent in all other maps. It was the first map ever granted a patent.

- A seven-room aluminum house designed to be mass-produced using aircraft construction techniques. It would sell, he estimated, for \$6,500 complete, far less than a conventional house offering comparable space and convenience. A prototype model, put on display in 1946, was received enthusiastically by housewives, designers, and magazines. But the project flopped when prospective backers got cold feet.

**Fortune smiles.** Fuller's financial success came in 1952. The Ford Motor Company wanted a dome over the exhibition court of its Rotunda Building in Dearborn. Company engineers couldn't figure out a way to build one, since the walls wouldn't support the weight of a conventional dome. Someone remembered hearing Fuller's theories and called him.

Five weeks later the court was domed. Ford had spent only a fraction of the estimated cost of a conventional dome. A new respect began to be attached to Fuller's name and theories.

Since then Fuller's fortunes have risen almost as fast as his domes. The Hono-

lulu dome captured the attention of industrial America. The State Department began using Fuller domes to house exhibits in India, Poland, Japan, and elsewhere.

The Marine Corps became interested and tested domes as front-line shelters. Said astonished Colonel Henry C. Lane in his final report, "They're the first basic improvement in mobile military shelter in 2,600 years." They're now standard Marine equipment from the poles to the tropics.

"My ideas," said the silver-haired Fuller recently, looking back on his long wait for acceptance, "have undergone a process of emergence by emergency. When they're needed badly enough, they're accepted. I decided long ago that unless my ideas were wrong, this would happen sooner or later. And I knew they weren't wrong. So I just invent, then wait until man comes around to needing what I've invented." Today more than 100 companies are licensed by Fuller to manufacture his inventions—mostly domes.

**Price is down.** Until recently, the only domes available were big ones like Kaiser's in the \$50,000-and-up class. But now two companies have hit the market with units sized and priced for the average consumer. Pease Woodworking Company of Hamilton, Ohio, makes a line of plywood domes usable as vacation cottages, garages, storehouses, classrooms, even complete homes. They range in price from about \$1,500 for a 26-foot model (fine for a vacation hideaway) to some \$4,000 for a 39-foot two-bedroom job roomy enough for a year-round house. Geospace Dome Shelters, made of plastic foam by Monsanto Chemical Company, are being sold for light, portable, easy-to-erect storage space. Both are do-it-yourself projects. Erecting either is similar to putting a 3-D jigsaw puzzle together with all pieces marked.

Now on the drawing boards at Synergetics, Inc., one of Fuller's companies, are designs for clear-plastic domes big enough to cover a house and yard. They would keep out rain, snow, dirt, and insects, and make the house easier to heat and cool. A smaller model would be ideal as a back-yard greenhouse or swimming-pool shelter. ■ ■



## What's New in Tires

[Continued from page 82]

Like the early tubeless, the new tires may have to be sold over the resistance of a skeptical public. Something seems to have been taken away rather than added.

But in today's original-equipment two-plys (unlike some lighter-duty ones that have been around for a while), the reduction in fabric layers does not result from a reduction in fabric. Instead, double-thick yarn is used to give the two-plys approximately the same weight of rayon as comparable four-plys. The good ones also contain the same amount of tread rubber. They have what the industry calls a four-ply rating.

**Promise of the two-ply.** Pairing the plies, say tire men, gives a slightly softer ride since its more flexible carcass permits greater sidewall deflection. This also increases the tire's "footprint," which results in improved traction and skid resistance.

And they also say in Akron that the two-ply has better high-speed durability, longer wear, and lower rolling resistance (the last of which could mean up to three percent gain in gas mileage). They may be a mite safer, too, because the fabric is laid down with a smaller cord angle (as measured from the center line of the tread).

Lowering cord angle is a familiar device for stiffening the tread and thus improving any tire's cornering stability, steering-wheel response, and high-speed capacity. Up to now it has been used sparingly because it also roughens the ride. But because two-plys are inherently softer, designers have been able to steal back a little of the comfort gain in the interests of better handling.

These advantages are partly offset by very slight reductions in strength, and in resistance to blowouts, cuts, punctures, and sidewall bruises. There are reports, too, that two-plys may present retreading problems. There is always the possibility that damage to one of the plies (through wear or over-zealous buffing) would leave you with a weak casing. And finally, the extra sidewall flexing causes some tires to check and crack sooner than comparable four-plys.

**No plies.** Goodyear has a couple of demonstrator cars touring the country on

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CONTINUED

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### What's New in Tires

colored, translucent tires that are lighted from the inside. In the dark they cast a weird but pretty light that tends to obscure their real importance: Unlike conventional tires that are built up layer by layer, these Goodyear showpieces are pour-molded without any supporting fabric whatever.

There's something for everybody in this development. To the industry it spells the possibility of automated tire production. For drivers it forecasts the completely uniform, splice-free, precision-made tires that may be coming.

These tires are made of polyurethane, a phenomenally wear-resistant (and costly) material often mentioned as the basis of a 100,000-mile tire. Right now it can only be used in molded tires, since it won't adhere to reinforcing fabrics. And polyurethane still has a number of other drawbacks, including severe flat-spotting, poor skid-resistance, and uncertain handling characteristics.

But Goodyear isn't worried. As tire developments go, all these are relatively minor and solvable problems. Some of the materials now in common use shaped up much worse in laboratory tests only a few years ago. While practical molded tires aren't here yet, some developers say that they are now definitely on the way.

**Rubber compounds**, like tire cords, have been improving steadily over the years. The current emphasis is on the polybutadiene group, which is said to wear longer, develop less heat, and resist cracking. Firestone recently announced a new snow tire—with a claimed 30 percent increase in tread life—in which "diene" makes up half the rubber content. Another major producer is testing an all-year premium tire with a high mixture of butadiene. This may not be announced very soon, however. While butadiene extends tire life in cold weather, it wears faster than present rubbers on hot pavements.

Butyl, the most heralded "new" rubber of recent years, has overcome most of its growing pains. It is now being offered by at least four leading manufacturers as well as under the private labels of two major oil companies.

A petroleum by-product, butyl rubber had become the standard inner-tube ma-

terial when tubeless tires came along. Since then, its producers have been trying to work the stuff into a safe and roadable tire.

They started with three tremendous advantages. Butyl is the most comfortable tire around; it's quiet, it doesn't squeal on curves, and it withstands ozone and weathering. Early tires, however, wore out fast and fell apart at high speeds. They started hard and increased gas consumption. And they couldn't be counted on to stop on ice, snow, or cold, wet pavements.

Current butyls have retained the initial virtues of the material. Their boosters say that the defects have been overcome or minimized. They are still not a good choice for racing or for long tread life, but butyls are now claimed to be safe for all normal driving.

**Tread patterns**—especially snow-tire treads—have a vital bearing on traction and wear. Engineers keep trying to extend these within the limits set by acceptable ride and noise levels. Development men at several companies are now hinting at radical new designs due next year.

Changes may come a lot easier with the adoption of three-piece curing molds such as those now used in regular production at Firestone (or four-piece molds like U.S. Rubber's). Up to now, most tires have been cured in two-piece molds. These require the tread to be designed with a parting line around the center.

Goodyear punches tiny holes in the outer surface of winter tires as a means of improving traction. In effect, this extends a trick used by some recappers who mix sawdust or ground-up walnut shells into their tread rubber. As the particles wear to the surface and fall out, they leave tiny ice-gripping holes in the tread.

One likelihood for next year is a snow tire with shredded wire dispersed through the tread rubber. Not to be confused with woven-steel-ply cord, shredded wire is now used in some truck tires in a thin layer between the cord and tread. Its job is to resist cutting and chunking-out, and to retard cut growth. In the new snow tires the wire would be extended right out to the tread surface where it would provide similar cut resistance plus a constantly renewed gripping surface. ■ ■



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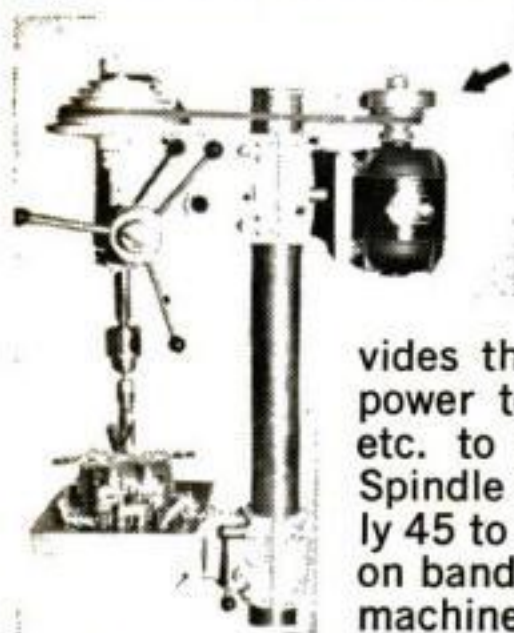


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### This Car Goes Anywhere

[Continued from page 47]

little from the army tank and the bicycle, the airplane and the racing kart—to say nothing of the old-fashioned bathtub.

It rolls on six low-pressure air bags. You really can't call them tires. There are no cords in the carcass and you can blow them up with about five man-size puffs of breath. They are the key to the Jiger's astonishing ability to go anywhere. They tread with the remarkably light touch of only one pound per square inch—light enough to stay on top of the mushiest swamp or all but the fluffiest powdered snow.

The resilience of the air bags gives the cushioning needed to keep all six wheels on the ground in rough going and provide a reasonably comfortable ride. This allows the axles to be rigidly fixed to the body, eliminating the weight and complication of spring suspension.

**Steers like a tank.** Power is delivered to all six wheels by chain drive. One engine drives the wheels on one side, the other those on the other side. You steer it like a tank: by slowing the engine on one side while speeding up the other, or applying brakes on one side.

The engines, transmission, steering, brakes, and controls are ingeniously unitized in one removable package. All controlling functions are by a single control column, reminiscent of the old airplane joy stick. You turn the T handle atop the control column to keep the kart on course or make slow turns. This speeds up one engine, slows the other. For a sharp turn-in-its-own-length, you apply brake on one side while holding the T handle in full turn position. Throttle control is by twisting the handle grips, and you change transmission ratio by moving the entire column forward or back. Clutch is automatic.

Move a couple of levers and the engines' output is shifted to a pair of screws for going in water. The screws are at an angle to the long axis of the hull and powered independently by each engine so that you still steer the same as on land.

**History of the Jiger.** It began during the depression. (The name JiGeR comes from adding the necessary vowels to John Gower's initials). Gower was cutting timber in Northern Alberta and had to



### ***This Car Goes Anywhere***

walk through snow some five to ten miles every morning to get to the job. While walking, he dreamed up designs for a vehicle that would go anywhere.

As a youngster, he had built a number of kid's cars using old washing-machine engines. All of his ideas for a practical, go-anywhere car revolved around simplicity and direct approach to design.

He carried his dream in the back of his mind through half a dozen different jobs. Five years ago, he began in earnest to build the dream car. Commercial de-

velopments in engines, fiber-glass molding, and tires were finally available to build the car.

Since exhibiting the first prototype last year, Gower has been flooded with inquiries about a variety of uses: The Army is interested in dropping them with paratroopers; several government bureaus and oil companies want them for exploring and surveying parties; rural mailmen have inquired, and sportsmen are eager to use it for everything from golfing to ice fishing. ■ ■

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Bee hives, packed in metal-mesh cases, are also mailable.

"But dead ducks are not," Miller concluded. "There's one codger who keeps trying to mail ducks to his friends. He ties an address tag to their feet, slaps a stamp on their beak, and expects us to carry them."

**Not all frogs and lizards.** This time we also had on board a large quantity of currency. But security regulations prevented Liskey and Miller from discussing this aspect of their normal routine.

"How much are we carrying?" I wanted to know.

"I have no idea," Liskey answered, hitching his revolver a little higher on the hip. "My job is to deliver it, not count it."

The men who work the Wash-Harris HPO have been advised, however, that on one special occasion in the past, they carried as much as \$800,000.

Front Royal, the northern terminus of the Sky Line Drive, was our halfway stop.

"We drop off a lot of mail here," Liskey said. "This is the terminal point for several star routes." (Star route operators transport the mail between towns; they do not work it en route.)

From Front Royal, we rolled south into the Shenandoah Valley—and also into a freak spring storm that coated the trees with a shaggy overcoat of ice.

**Rough-weather country.** "Flash floods are common here," Liskey informed us. "This HPO has often been held up because of them. And in winter we're often the second vehicle into the Valley—right after the snowplow." He added proudly, "We've been delayed and detoured, but never annulled."

The sky was clearing when we arrived in Harrisonburg at 9:55 a.m. We had delivered a lot of mail, but we had picked up a lot, too. This would be dropped off here or transferred to two connecting HPOs, one running south to Roanoke, Va., the other north to Martinsburg, W. Va.

There is a normal 6 hour and 25 minute layover in Harrisonburg. As he signed out for his home on the outskirts of town, Liskey told us that the schedule was set up so that the HPO could deliver

the mail early in the day and make the return "pickup" trip as late as possible.

**Return trip.** Due to leave at 4:20 p.m., we pulled out on the button. Irvine Crawford had replaced Liskey as supervising clerk. Miller still worked the sacks.

"We carry a different type of mail on this trip," Crawford explained. "We almost always have some Virginia hams from old man Earman's smokehouse . . . and there's seldom a trip when we don't have a batch of chirping chickens in back." (Our chicks were one day old.)

As he worked the case at a steady 40 letters a minute, Crawford proved to be a mine of information about the Valley.

He told how the hamlet of Keezletown did not become the county seat. (The original Mr. Keezle accepted a few too many hot toddies from the original Mr. Harrison, who raced to Richmond and won the county seat for Harrisonburg.)

He told how stretches of Route 33 between McGaheysville and Elkton follow the pre-Revolutionary buffalo and Indian trail, how the Valley was opened in 1732, and about the Confederate victory at Front Royal during the Civil War.

After Front Royal, however, the stories suddenly stopped.

"The mail always builds up on the latter part of the run," he said. "The closer we get to Washington, the more mail we have to work."

**Big day's work.** By the time we reached Washington, all the mail had been sacked and was ready for transfer.

"Well, we moved about 225 sacks of parcel post and second-class mail, plus about 92 pouches of first-class mail," Crawford said. (Each first-class pouch has about 30 packets of mail, and each packet about 40 letters, so it added up to more than 110,000 letters.)

"The average person," Crawford commented, "has no idea of what happens from the time he drops a letter in the box until he sees the man in gray coming down the walk. This is only one part of the process."

It was after 10 p.m. when the last bag was signed out and Crawford and Miller said good night. They and the Wash-Harris HPO were due back on duty in less than six hours—four a.m. the next day. ■ ■





### A ringer for Liberty Bell

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## This Man Can Broad-Jump 368 Feet

[Continued from page 106]

Corseted in a contour-molded, padded back pack of fiber-glass, designer Moore was tethered to the ceiling like a man-size marionette. In his first flight he roared to a height of six inches. Lurching under 100 pounds of top-heavy equipment, he staggered and bobbed in a 10-foot circle, while his ground crew strained at guide ropes. Nevertheless the flight was a success; it proved the belt would support a man in the air.

**A disaster.** Though intended for safety, the guide lines actually made early tethered flights awkward and hazardous. On Moore's last one, his tanks snagged a rope. He flipped over, panicked, cut the jets, and crashed to the floor, ending with a smashed kneecap—and a cast from toe to thigh. Graham, already tapped for alternate tester, was watching.

Pressed into service, Graham gamely crash-programed through preliminary indoor training, and last April 21 made that pioneering free flight outdoors.

His qualms vanished. "It was great," he says. "For the first time, I had complete freedom of movement—control exclusively in my own hands. Those protective lines hampered us more than we thought." They haven't been used since.

I watched Graham helped into his rig for a recent demonstration run. Soon he was ready—gauges checked, buckles firm, earplugs in place. The jets' din reaches 130 decibels, comparable to a pneumatic riveter at four feet.

Graham motioned us back, spread his legs for balance. His hands, propped by armrests, grasped motorcycle-style control grips. On his back were three tanks—two of hydrogen peroxide, one of compressed nitrogen gas.

A twist of his right hand on the fuel control shot a thin stream of nitrogen-pressurized peroxide through the silver screens. Superheated steam blasted the ground, stirring up dust like a miniature tornado. Graham opened to full power and slowly rose into the air, twin jets shrieking. He sailed up and over a truck, and landed as lightly as a dandelion seed on the other side.

To travel forward, he explains, he simply leans ahead, tilting the direction of the blast. To slow down, he just straightens up again. The control grip

in his left hand counters yawing—skidding sideways—by deflecting the steam jets to one side or the other with little vanes at the tips of the nozzles.

He rockets off in style. A rubber suit shields him from possible burns in case of a fall. Once, though, he suffered an airborne hotfoot when he forgot to strap a boot tightly.

How about the danger of running out of fuel in mid-flight? "You know when you're getting low on fuel," Graham says. "When tank pressure drops near the danger point, a little motor in the helmet spins a vibrator at the back of your head. You can't ignore it." The vibrator supersedes a warning lamp that Graham, with so much to concentrate on, once nearly missed seeing.

Next, designer Moore aims to:

- Cut weight. Specially designed parts, instead of off-the-shelf ones, should slice weight by half.

- Increase range. Ultimately, Moore predicts, rocketmen will be able to fly nearly a mile.

- Develop a safety parachute. Highest flight so far is 35 feet. By using up all its fuel, the present rig could boost a man 1,000 feet.

- Add wings. Future winged models may rocket half a mile high, then glide to great distances.

Rocket belts will find limited civilian uses within two or three years, Moore foresees, and will ultimately prove as versatile as helicopters.

The U.S. Department of Agriculture is looking into the Bell rig as a possible aid in fighting forest fires. To save the time now lost in locating a fire after its smoke is seen, a ranger might strap on a rocket, take off from his tower, and follow the smoke to its source.

The New York Fire Department is interested in whether rocket belts could be used to carry rescue lines to building tops. Policemen, too, might swoop to roofs to nab hoodlums hurling down bricks and bottles.

Rocketborne steeple jacks may someday zoom up TV towers and float down again when repairs are done. And when we've colonized the moon, rocket belts would offer an ideal way to get about on its craggy surface. ■ ■



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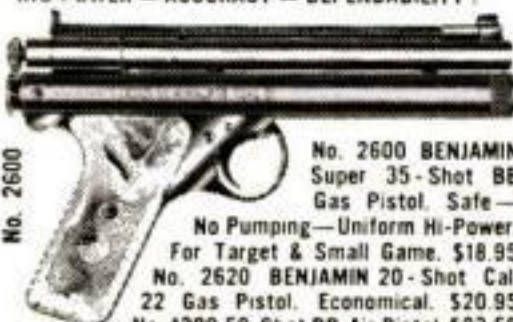
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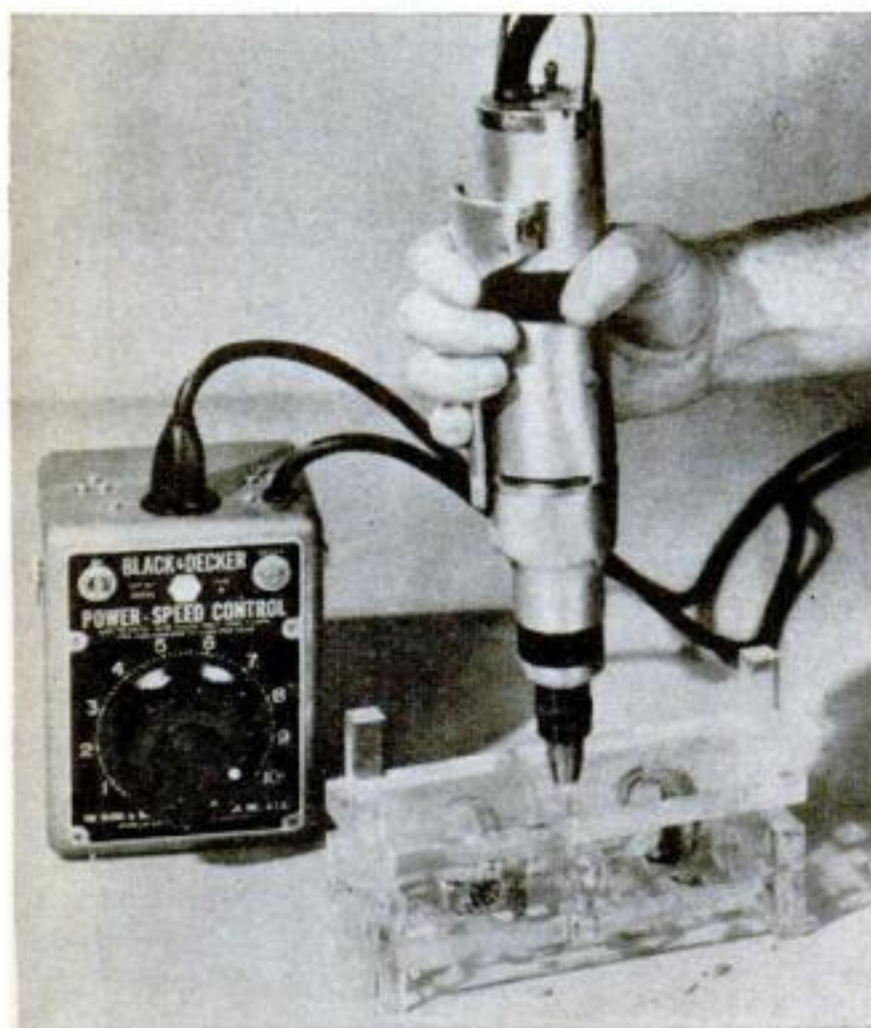




### Fragile Eggs Stop Power Tool

ON ASSEMBLY lines where an extra twist of a screw can crack fragile materials such as porcelains and some plastics, this power screwdriver promises fewer headaches.

To demonstrate its delicate torque adjustment, Black & Decker set up eggs between plastic plates joined with a screw at center. As the plates were drawn together, the resistance of the shells disengaged the driving shaft. At maximum torque, pressure cracked walnuts (below).



### Tiny Race Cars Give Full-Size Thrills

[Continued from page 74]

iaturized motors are no bigger around than a dime and not much thicker. Drive shafts carry the power to the geared rear axles. A rheostat allows the cars' speed to be varied by pressing a button, lever, or trigger on the hand controls. Top speed is from 6 to 10 m.p.h.

A guidepost attached well forward on the underside of each car fits into a shallow groove running down the middle of each lane and stabilizes the front end. Rear wheels remain free to slide out—or drift—in the turns. If cornered too hard, the car can jump the groove and spin out or flip as in a real race.

Driving technique is also similar to the real thing. Coming into a corner, you pick a shutoff point. When power is cut, drive-train drag quickly slows the tiny car, much as engine drag slows a real car after a downshift. As the rear wheels start sliding, you apply power and accelerate out of the turn. If your timing is right, the car will be pointing directly into the straight as it comes out of the corner.

*Regular maintenance is necessary*, as with a real car. Periodic lube jobs—a few drops of oil in the moving parts—assure top performance. After several races the soft-rubber tires begin to wear smooth. They have to be roughed up with sandpaper to increase traction. An engine that runs too long may burn out.

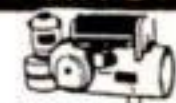
Some model-racing fans experiment with brush readjustment and armature filing to hop up their cars. A few even build their own cars, using inexpensive and readily available miniature electric motors for power. Bodies can be carved from balsa and reinforced with a plastic-resin skin.

A large variety of model-racing setups is available. Sizes range from the tiny HO-scale cars—which can be incorporated into a model-railroad layout—on up to 7½-inch-long, 1:25-scale models. Some sets are strictly for racing, others simulate highway driving. Most models use roadways, but a few run on train tracks.

Prices for basic sets run from about \$10 to \$50. But, as with model railroad-ing, it's easy to become hopelessly addicted to the hobby. Hundreds of dollars can be spent on additional cars, racing pits, lap counters, grandstands, and other equipment. ■ ■



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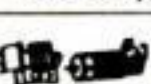
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(signed) Eugene S. Duffield, President

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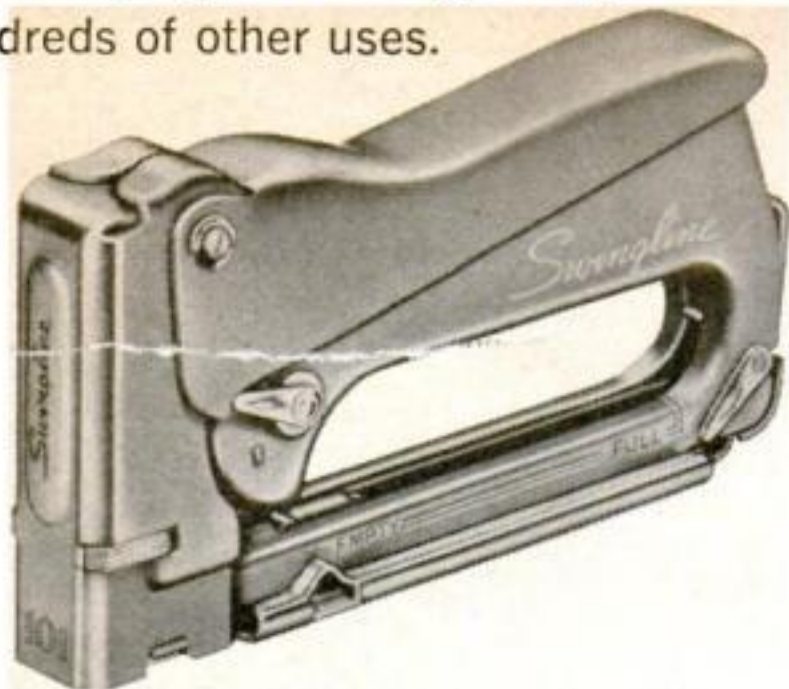
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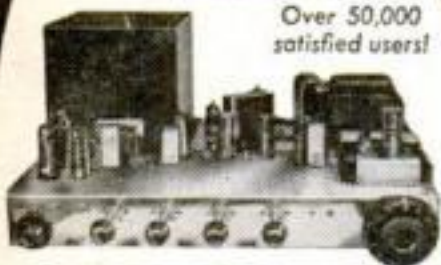
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## Who Pays If You Crash?

[Continued from page 53]

What about the printing on the ticket? Lawyers disagree. Some say it makes no difference; anyone can print anything on a ticket and it isn't binding. Others say: If you read the ticket before you pay or leave your car, a court may hold that you accepted the terms; but if you don't read the ticket, you haven't consented to what it says. "You can't consent," says Lambert, "to what you don't know."

### The wrong-side-of-the-road puzzle

Here's one that lawyers and policemen argue about over coffee.

You're driving down the right side of the road. Suddenly, up ahead you see a car charging wildly at you on your side of the two-lane road. No other cars are in sight. Obviously this driver doesn't realize he's on the wrong side.

If you stay in your lane, a head-on crash seems inevitable. If you pull off the road, you'll go into a ditch and turn over.

You yank the wheel and pull into the

.....

**Next Month: Popular Science brings you the results of the first full-scale test of Chevy II. PS editor-drivers racked up more than 10,000 miles—over mountains, across deserts, in big-city traffic—to compile this frank report-from-the-driver's-seat on Chevrolet's new economy car. Read it in January PS!**

.....

left lane, hoping the car will pass you safely on your right.

But suddenly the driver comes to, swerves back into his lane, and you hit him head on.

He sues. "You caused the accident," he says. "You were in the wrong lane."

Cases like this happen now and then. To solve them, courts often rely on something called the "emergency doctrine."

Courts know that in split-second emergencies (in what is known as the "presence of the uplifted knife") there is no time for reflection. It's a little like the wasp case.

If the court finds that in the agony of the moment you did what "any prudent man" would have done, then you're probably off the hook. ■ ■

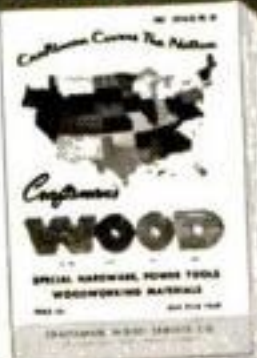
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lunch, not the girl, that attracted the animal. Still, the housewife was taking no chances. She dashed out and screamed a warning. The coyote vanished. The girl had thought it was a dog.

Recently, a householder in the same vicinity telephoned next door to warn a friend that she'd better take her baby out of the play pen in the back yard, for three police dogs were circling it.

They weren't police dogs. They were coyotes.

There's no known instance of a coyote's attacking a human being, but this implication that one might has sent shivers down the spines of many people who previously felt they could learn to live with the animals.

**Nocturnal serenade.** One irate woman resident of Hollywood Hills informed the police that she was being kept awake half the night by the howling of coyotes. When it was suggested that she was exaggerating, she threatened to make a tape recording to play to the councilmen.

Another lady, on the contrary, moved into the Hills solely because she *wanted* to hear the coyotes howl. A musician who lives there reports that they howl in D flat, his favorite key.

An increasing volume of complaints to City Hall has resulted in an incongruous situation: Trappers with official backing are now trying to catch coyotes in the midst of millions of people. Trapping is the only feasible method of attack. Poisoning would endanger too many other forms of life. So would shooting. Hunting dogs are no match for coyotes, which would gang up on them in a fight, and furthermore, they are so fleet that only a greyhound or an Afghan hound could outrun them.

"I'd dethrone the lion and make the coyote king of beasts," declares Renny McEvoy of North Hollywood, a writer-actor whose hobby is hunting and trapping. "Frank Buck told me years ago that the coyote is the smartest of all animals, and I'm certainly ready to agree."

McEvoy speaks with authority. He was the first trapper that Los Angeles enlisted to deal with coyote complaints. So far, he has been by all odds the most successful. In the past two years, McEvoy has trapped 58 coyotes within 15 minutes'

drive of the famed corner of Hollywood and Vine. But it has taken every trick he learned from an old Indian back in Fremont, Ohio, in his boyhood.

**The hunt is on.** The tricks begin with the boiling of traps and gloves to remove the telltale human scent. McEvoy carries two pairs of boiled gloves so that he can switch to a fresh pair when he sets the traps. Following Indian instructions, he also dips his shoes in aged chicken guts and then waddles the last few yards to his intended trap site in an equally pungent gunny sack, so as not to leave a recognizable human spoor.

He found out early that it did no good to bury the lure beneath a carefully hidden trap. Invariably, the coyotes would dig the bait out from under the trap, leaving it unsprung. One particularly contemptuous coyote, after enjoying the bait, overturned the trap and left his calling card on it.

What works better is to bury the lure in the center of a ring of buried traps, each one about the distance between a coyote's nose and front paw away from the bait. With further Indian guile, McEvoy then sprinkles the area with a watering can, tosses a handful or two of dead leaves across it, as if the wind had blown them there, and whisks away all trace of footprints with a branch.

Despite these devious precautions, it took him three weeks of daily campaigning to catch his first coyote. And even now, more often than not, the intended victim shows that he's onto the game by incredibly dusting off the pan of a single trap—"even the weight of a chipmunk would spring it," declares McEvoy—and going freely on his way.

The Los Angeles campaign against coyotes is not a unanimous crusade. Defenders of the animals claim they are the innocent victims of the human population explosion and threatened with extinction by rampaging realtors. Some of these champions have even caught rats in their back yards and taken them up into the hills to release for the coyotes.

The frequently frustrated city trappers, on the other hand, are convinced that, innocent or not, the clever coyotes are not going to become anybody's victims in a hurry. ■ ■



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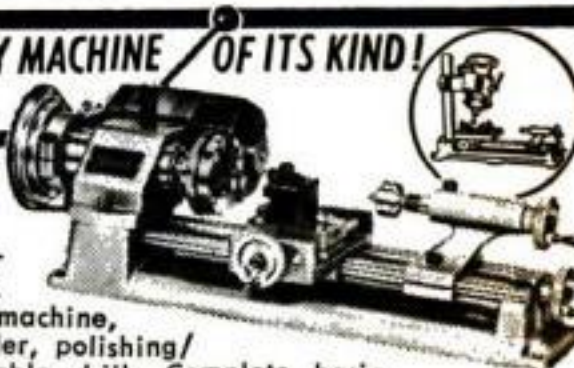
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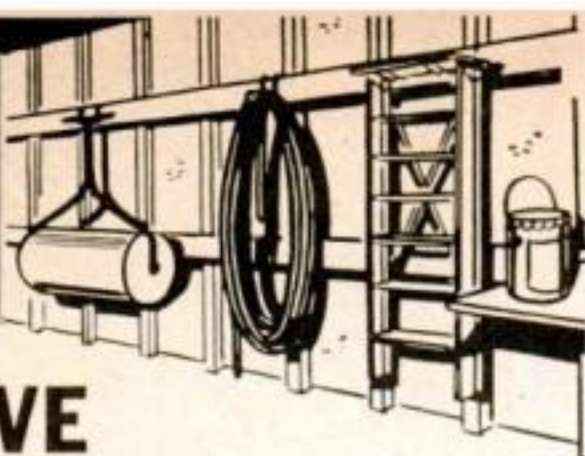
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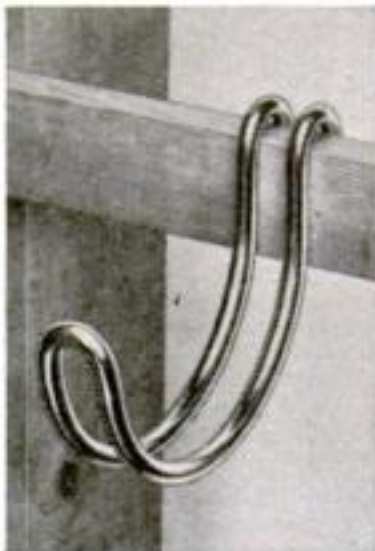
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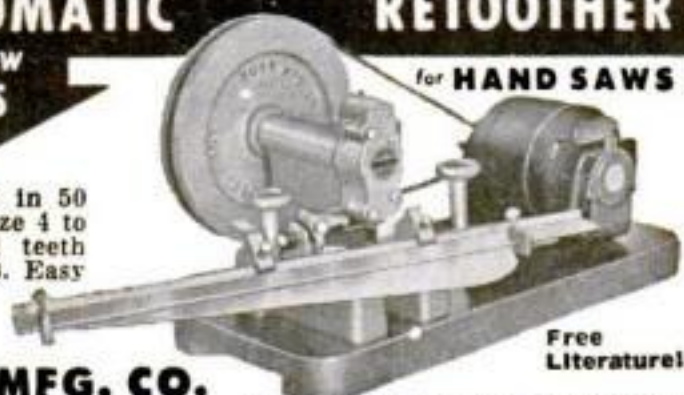
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## What's So Good About 4-Speed Boxes?

[Continued from page 65]

Chevy's sports Corvette has had a fully  
synchronized four-speed since 1957 with-  
out evoking any reverberations among  
owners of ordinary cars.

**Buckets and boxes.** In the autumn of  
1960 Chevy introduced two new vehicles,  
its Greenbrier personal passenger van  
and a little truck, both powered by the  
Corvair engine. Each had a four-speed  
transmission for good reason: Their  
weight called for more engine-torque mul-  
tiplication than a standard manual trans-  
mission could supply.

Buick, during this period, introduced  
a sporty little bucket-seated number  
called the Skylark in its new Special  
series. Chevy was not doing so well with  
the Corvair. Ford's Falcon was winning  
the compact-car race in a walk. The  
Chevy people took a long, hard look at  
the Skylark, and produced their bucket-  
seated Monza. Then, almost as an after-  
thought, they offered the Monza with a  
four-speed box.

That did it. The return engagement  
of the manual four-speed transmission,  
after all those years, was on.

For the present, anyway, a substantial  
body of holdouts remains in Detroit.  
None of the Chrysler Corp. nor American  
Motors cars offers a four-speed. Chrysler  
junked its unhappy experiment with a  
four-speed in its 300 series two years  
ago.

But more and more four-speeds are ap-  
pearing. It's an odds-on bet that Ford's  
Falcon and Mercury's Comet will offer  
this option before long.

None of these tasty new transmissions  
has been adapted from a truck box. All  
except the Corvair's are modified versions  
of standard shelf items from Borg-  
Warner. Even the Corvette transmission  
is a Borg-Warner. Corvair manufactures  
its own four-speed and supplies it in  
modified form for the Tempest.

**Engineers go back to school.** "Funny  
thing," remarked a transmission-section  
chief in a major automobile manufactur-  
er's engineering department recently, "but  
a lot of our young engineers had worked  
only on automatic boxes. They never had  
occasion to look inside a manual box.  
We're having to teach them."

A lot of automobile-agency mechanics  
no doubt will need teaching, too. ■ ■



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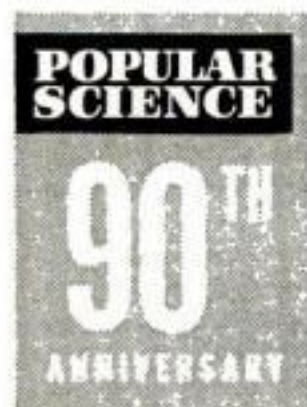
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